

EOS Conferences at the World of Photonics Congress 2011

23 - 25 May 2011, International Congress Centre Munich (ICM), Germany

ADVANCE PROGRAMME

EOSMOC 2011

2nd EOS Conference on
Manufacturing of Optical Components

EOSOF 2011

1st EOS Conference
on Optofluidics



20th International Congress on
Photonics in Europe
co-located with
LASER World of PHOTONICS 2011
Messe München GmbH
Messegelände, 81823 München
Tel.: (+49 89) 949-114 68
info@photonics-congress.com
www.photonics-congress.com

EOSMOC Sponsors:



Media Partner:



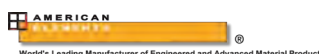
Cooperating Organisations:



EOSMOC is organized
in cooperation with:



Sponsors:



About EOS.....	1
The venue & getting there.....	3
Location overview	4
LASER World of Photonics Exhibition.....	4
The city: Munich.....	5
Accommodation information & hotel list.....	6
Information for authors and attendees.....	8

2nd EOS CONFERENCE ON MANUFACTURING OF OPTICAL COMPONENTS (EOSMOC 2011)

Foreword by the General Chairs.....	10
Scientific Committee & sub-conferences.....	11
Invited Speakers.....	12

Programme

EOSMOC 2011 at a glance.....	13
------------------------------	----

Oral presentations

Monday, 23 May.....	15
Tuesday, 24 May.....	18
Wednesday, 25 May.....	21

Poster presentations.....	25
----------------------------------	-----------

1st EOS CONFERENCE ON OPTOFLUIDICS (EOSOF 2011)

Foreword by the General Chairs.....	31
Scientific Committee.....	32
Keynote Speakers.....	33
Invited Speakers.....	33

Programme

EOSOF 2011 at a glance.....	35
-----------------------------	----

Oral presentations

Monday, 23 May.....	37
Tuesday, 24 May.....	40
Wednesday, 25 May.....	43

Poster presentations.....	48
----------------------------------	-----------

Registration fax form.....	53
Upcoming EOS events.....	55

ABOUT EOS

History

The European Optical Society (EOS) was founded in 1991. The purpose of the society is to contribute to progress in optics and related sciences, and to promote their applications at the European and international levels, by bringing together individuals and legal entities involved in these disciplines and their applications. EOS is a not for profit organisation and serves as the joint forum for all individuals, companies, organisations, educational institutions, and learned and professional societies, who recognise the opportunity and challenge that a common European base provides for the development of optics in its broadest sense. EOS organises recognized topical meetings, conferences, workshops and other events, publishes journals and is an important player on the European level. 22 national optical societies and a great number of individuals and companies are currently members of EOS (www.myeos.org).



Membership modes and fees

Individual membership

Annual fee: 50 € | www.myeos.org/members/individual

Individual membership through an EOS Branch

Every member of an EOS Branch is automatically an individual member of the EOS, too, with all benefits.

Annual fee: 18 € (included in the Branch membership fee) | www.myeos.org/members/societies

Student membership

Annual fee: 10 € | www.myeos.org/members/student

Associate membership through an EOS Affiliated Society

Every member of an EOS Affiliated Society is automatically an associate member of the EOS, too, but with limited benefits.

Annual fee: 8 € (included in the Affiliated Society membership fee) | www.myeos.org/members/societies

EOS membership - Join us and...

- Be a part of the umbrella organisation of the national optical societies in Europe
- Connect with colleagues from all over Europe and beyond
- Contribute to strengthening Europe's future in optics and photonics
- Stay up-to-date about European Research Funding
- Benefit from discounts on EOS events and publications in the EOS online journal JEOS:RP
- Receive the Annual EOS Member Directory - your guide to the European optics and photonics community

Activities

- Organisation of topical meetings, workshops and conferences, and endorsement of other scientific events
- Operation of a virtual platform for the European optics and photonics community at www.myeos.org
- Focus Groups and Student Clubs (as of 2011)
- Publication of JEOS:RP, the electronic Journal of the European Optical Society - Rapid Publications (www.jeos.org)
- Bi-monthly electronic member newsletter
- Representation of the optics and photonics community on the European level (Photonics21 Technology Platform)
- Annual award of the EOS Prize

QUESTIONS?

Please contact the EOS Office at info@myeos.org or visit our website at www.myeos.org/members

Upgrade for associate members

Upgrade to an individual EOS membership with full benefits: 12.50 €/year | www.myeos.org/members/associate

Corporate membership through an EOS Branch or Affiliated Society

Annual fee: 200 € | www.myeos.org/members/corporate

Direct corporate membership

Annual fee: 300 € | www.myeos.org/members/corporate

How to join?

To join the EOS as an individual, student or corporate member, please...

- fill in the fax form at www.myeos.org/download/Membership_FaxRegistration_2011.pdf
- or visit our online shop at www.myeos.org/shop

THE VENUE & GETTING THERE



ICM - International Congress Centre Munich
 Messe München GmbH
 Am Messesee
 D-81829 Munich

BY AIRPLANE

+++ Special offer with Lufthansa - discounted travel for international attendees

Lufthansa German Airlines offers a comprehensive global route network linking Munich with major cities around the world. As the Official Airline to this event, Lufthansa offers special prices and conditions to all international attendees.

Detailed information about this special offer is available at the World of Photonics Congress website:
<http://world-of-photonics.net/en/photonics-congress/travel-accomodation/getting-there/plane> +++

From the airport conference attendees may either use a special bus shuttle, a taxi or the public transport.

By bus shuttle

From the airport to the ICM:

From 22 - 26 May, there will be organised airport bus shuttles to the ICM/from the ICM to the airport (7.50 € one way; round-trip ticket 12.50 €). Travel time: approx. 45 minutes.

Shuttle buses are provided from 8:00 to 18:00 and are running every 30 minutes.

Terminal 1, Area A, starting at 8.00, then 8.30 etc.

Terminal 2, 4 minutes earlier, starting at 7.56, then 8.26 etc.

Terminal 1, Area Z (Central Area), 4 minutes later, starting at 8.04, then 8.34 etc.

Please note: Buses do not stop at Area D.

From the ICM ("West entrance") to the airport:

Shuttle buses are provided from 9.30 to 19:00 every 30 minutes.

With public transportation

Please note that your registration **does not include** a ticket for public transport.

From the airport to the ICM:

The train station for the S1 and S8 municipal trains is located directly under the Central Area of the Munich Airport. Trains depart for downtown Munich every 10 minutes. You can choose one of the following routes for your trip to the trade-fair center:

Route S8 / U5 / U2

From the airport, take the S8 to "Ostbahnhof" (Munich East).

Transfer to the U5 (toward "Neuperlach Süd") and travel to the next station, "Innsbrucker Ring". Then, from the same platform, transfer to the U2 subway line (toward "Messegelände"). Disembark at "Messestadt West" or "Messestadt Ost".
 Travel time: approx. 46 minutes.

Route S8 / U2

From the airport, take the S8 to "Hauptbahnhof" (Munich central station). Transfer to the U2 subway line (toward "Messegelände"). Disembark at "Messestadt West" or "Messestadt Ost". Travel time: approx. 60 minutes.

Route S1 / U2

From the airport, take the S1 to "Feldmoching" or "Hauptbahnhof" (Munich central station). Transfer to the U2 subway line (toward "Messegelände"). Disembark at "Messestadt West" or "Messestadt Ost". Travel time: approx. 65 minutes.

From the airport to "Hauptbahnhof":

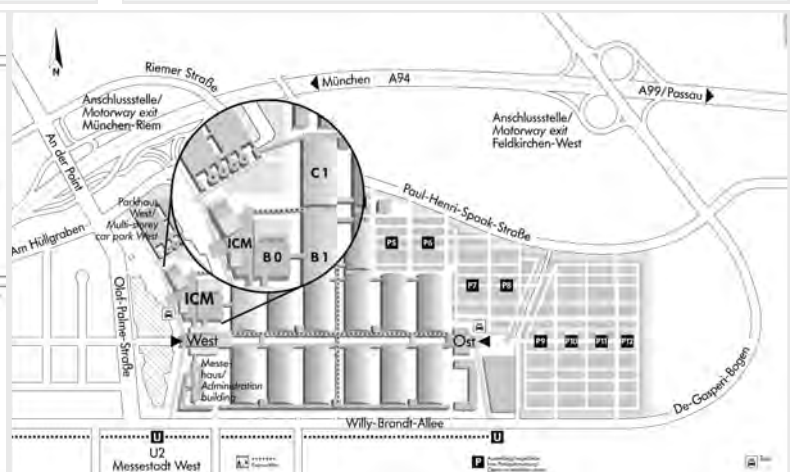
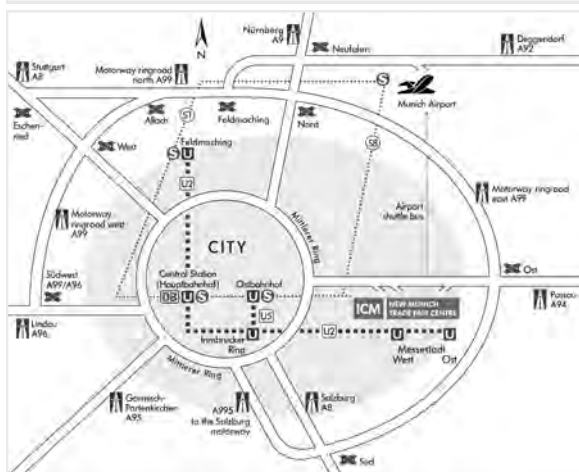
Take S1 (direction "Ostbahnhof") or S8 (direction "Geltendorf") and get off at "Hauptbahnhof". For information on getting from "Hauptbahnhof" to the ICM, please follow the recommendations under "By train/public transport" on the next page.
 Travel time: approx. 45 minutes.

TICKETS AND PRICES

- For a round trip: using a Single Day Ticket for entire network is recommended: 10,80 €
- For a single trip there are two alternatives:
 - Single ticket for 4 zones: 10,00 €
 - Stripe ticket (sold as a set of ten stripes for 12 €). For the journey from the airport to "Messestadt West" or to Munich central station you have to validate 8 stripes (for 4 zones= 9,60 €).

Further information:

- A map of the MVV entire network can be downloaded here: www.mvv-muenchen.de/web4archiv/objects/download/netz11a4englisch.pdf
- A journey planner as well as a link to a ticket navigator (at the bottom of the page) is available at the congress website: <http://world-of-photonics.net/en/photonics-congress/travel-accomodation/getting-there/public-transport>



THE VENUE & GETTING THERE (continued)

BY TRAIN/PUBLIC TRANSPORT

If you travel to Munich by train, you may arrive at Munich central station ("Hauptbahnhof"). The journey from the central station to the New Munich Trade Fair Centre/ICM takes about 20 minutes by underground U2 (direction "Messestadt Ost"). Please get off at "Messestadt West".

From the Munich central station to the ICM

During peak periods the U2 runs every five minutes (07:30-10:10, from the central station "Hauptbahnhof"; 15:10-18:55, from the ICM station "Messestadt West"). The travel takes approximately 20 minutes.

TICKETS AND PRICES

Your registration **does not include** a ticket for public transport.

- For a **round trip** you may purchase a single day ticket ("Innenraum"=inner district): 5,40 €
- For a **single trip** there are two alternatives:
 - Single ticket for 1 zone: 2,50 €
 - Stripe ticket (sold as a set of ten stripes for 12 €). For the journey from the Central Station to "Messestadt West" you have to validate 2 stripes (for 1 zone= 2,40 €).

MVV tickets for any means of public transport can be obtained

- from ticket machines (S- and U-Bahn stops)

- at ticket offices (Kiosks etc.)
- or in regional busses
- Single tickets and day tickets are also available at ticket machines in trams or busses

Please note:

→To avoid long waiting times at the ticket machines around the fairground in Munich, we would recommend purchasing your tickets for public transport directly when you arrive at the airport or the Munich central station.

→Do not forget to validate your ticket in the blue ticket-cancelling machine before you start your trip. Only the tickets from bus and tram ticket machines are already validated.

Further information:

- For schedules, maps etc. please refer to the website of MVV: <http://www.mvv-muenchen.de/en/home/tickets/ticketoffers/messe-besucher/index.html>.
- A map of the MVV entire network can be downloaded here: www.mvv-muenchen.de/web4archiv/objects/download/netz11a4englisch.pdf
- A journey planner as well as a link to a ticket navigator (at the bottom of the page) is available at the congress website: <http://world-of-photonics.net/en/photonics-congress/travel-accomodation/getting-there/public-transport>

BY CAR

Due to Munich's good infrastructure, the ICM can easily be reached from all directions. The ICM is located directly on the A94 motorway, exits "Feldkirchen-West" (Exit No. 6) or "München-Riem" (Exit No. 5). Please follow the trade fair signs (Messe/ICM) which you will find throughout the city. A dynamic traffic-guidance system guides congress attendees to the nearest available parking area at the ICM.

Important information:

The city of Munich is a low emission zone, therefore high-emission vehicles are no longer allowed to drive in the city center. A sticker will be required to prove that your vehicle fulfills the EU exhaust standards.

From October 1, 2010, **only vehicles with a yellow or a green sticker are allowed to drive into the centre of Munich**, vehicles with a red sticker are not allowed. This also applies to anyone visiting the city. The new regulation covers all automobiles, buses, motor homes and trucks. The "Mittlerer Ring" itself is not in the low emission zone.

Messe München GmbH and DEKRA Automobil GmbH have set up a service point for exhibitors and visitors. Emissions stickers may be purchased at DEKRA for EUR 5.00.

Driving to the New Munich Trade Fair Centre / ICM with a navigation system

- As a visitor of an event being held at the New Munich Trade Fair Centre or the ICM, the destination address to enter into your navigation system is "An der Point".
- Depending on which navigation system you use, the New Munich Trade Fair Centre and the ICM are listed under the categories "Exhibition Center", "Trade-fair Center" and under the German keyword "Messe".
- Some navigation systems allow you to specify a certain entrance to the trade-fair center. In this case, please select the West entrance, Am Messesee, 81829 München.

DEKRA Automobil GmbH

Munich East Service Point
Karl-Schmid-Str. 14
81829 München
Tel. +49(0)89/42007-0

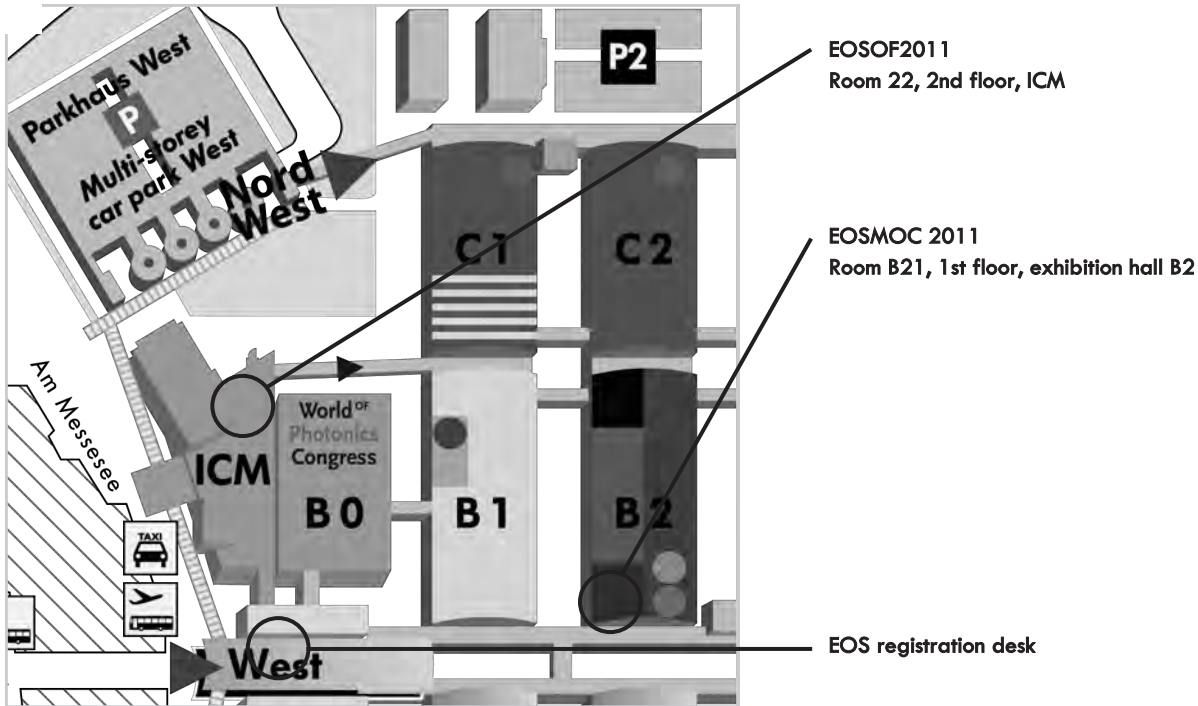
Opening times:

Mon-Wed, Fri: 7:30-18:00
Thurs: 7:30-20:00
Sat: 8:00-12:00

Further information on getting to the ICM with a navigation system, the low emission zone and parking areas is provided at the congress website: <http://world-of-photonics.net/en/photonics-congress/travel-accomodation/getting-there/automobile>

NOTES

LOCATION OVERVIEW



LASER WORLD OF PHOTONICS EXHIBITION

World of Photonics Congress is co-located with:

20th INTERNATIONAL TRADE FAIR AND CONGRESS FOR OPTICAL TECHNOLOGIES - COMPONENTS, SYSTEMS AND APPLICATIONS
 23 to 26 May, 2011 - New Munich Trade Fair Centre, Munich (DE)

Industry marketplace, think tank, knowledge forum, source of momentum, gathering for solution providers and networking: When it comes to LASER World of PHOTONICS, everyone's focus is a little bit different. But they all appreciate one thing: its consistent orientation to applications.

Hall	Exhibition overview
B1/C1	Laser und Optronik <i>Lasers and optronics</i>
B1	Biophotonik und Life Sciences <i>Biophotonics and life sciences</i>
B1	Photonics Forum Halle B1 „Biophotonik und Life Sciences“ <i>Photonics Forum Hall B1 "Biophotonics and life sciences"</i>
B2	Optische Informationstechnologie <i>Optical information technology</i>
B2	Optik / Fertigungstechnik für Optiken <i>Optics / Manufacturing technology for optics</i>
B2	Sensorik, Mess- und Prüftechnik / Optische Mess-Systeme <i>Sensors, test and measurement / Optical measurement systems</i>
B2	Imaging <i>Imaging</i>
B2	Career Center <i>Career Center</i>
B2	Photonics Forum Halle B2 „Optische Technologien“ <i>Photonics Forum Hall B2 "Optical technologies"</i>
C1/C2	Laser und Lasersysteme für die Fertigung <i>Lasers and laser systems for production engineering</i>
C1	Sonderschau „Photons in Production“ <i>Special Exhibit "Photons in Production"</i>
C2	Photonics Forum Halle C2 „Laser und Lasersysteme für die Fertigung“ <i>Photonics Forum Hall C2 "Lasers and laser systems for production engineering"</i>
ICM	World of Photonics Congress

Your registration for the EOS conferences includes free entrance to the exhibition as well as admission to all conferences at the World of Photonics Congress 2011!

Opening hours of the exhibition:

- Monday, 23 May - Wednesday, 25 May:
9:00-17:00
- Thursday, 26 May:
9:00-16:00

<http://world-of-photonics.net/en/laser/start>

THE CITY: MUNICH

Besides the World of Photonics Congress, Munich has much to offer. The city does a perfect job of combining the professionalism of a commercial, media and research centre with culture and hospitality.

Famous sights in the city centre to be worth visiting are:

- Cathedral Church of our Lady - Frauenkirche (Frauenplatz 1, 80331 Munich; station: "Marienplatz"; U3,U6, all S-Bahn lines)
- Church of St. Peter - Alter Peter (has an old tower from which you will have a nice view over Munich; station: "Marienplatz" U3/U6, all S-Bahn lines)
- Viktualienmarkt (Munich's biggest and most popular open air market, Am Viktualienmarkt 6, 80331 Munich; station: "Marienplatz" U3/U6, all S-Bahn lines)
- English Garden (between Prinzregentenstreet and Freimann)

For more information on Munich's sights, please refer to Munich's Tourist Office:

www.muenchen.de/Rathaus/tourist_office/57799/index.html



Guided tours in Munich are e.g. organised by

- Spurwechsel: www.spurwechsel-muenchen.de/en/site/index
- Stattreisen: www.stattreisen-muenchen.de/
- Weis(s)er Stadtvogel: www.weisser-stadtvogel.de/
- Radius Tours and Bikes: www.radius-tours.com/index.php

For more information, please refer to the organisers website.

Bavarian restaurants in the city centre:

- **Ratskeller** | www.ratskeller.com/

Opening times: daily 10:00–midnight

Marienplatz 8, 80333 München (station: "Marienplatz" U3/U6, all S-Bahn lines)

- **Spatenhaus an der Oper** | www.kuffler-gastronomie.de/de/muenchen/spatenhaus/

Opening times: daily 9:30–00:30

Residenzstr. 12, 80333 München (station: "Marienplatz" U3/U6, all S-Bahn lines; or Odeonsplatz U4/U5)

- **Der Pschorr** | www.der-pschorr.de/

Opening times: daily 10:00–23:00

Viktualienmarkt 15, 80331 Munich (station: "Marienplatz" U3/U6 and all S-Bahn lines)

- **Weisses Bräuhaus** | www.weisses-brauhaus.de/

Opening times: daily 8:00–01:00

Tal 7, 80331 Munich (station: "Marienplatz" U3/U6 and all S-Bahn lines)



Especially in summer, Munich's beergardens are a must and really worth visiting:

- **Biergarten am Viktualienmarkt**

Opening times: Mon-Sat 9:00–22:00, Sunday closed

Viktualienmarkt 9, 80331 Munich (station: "Marienplatz" U3/U6 and all S-Bahn lines)

- **Biergarten am Chinesischen Turm** (in the English Garden)

Opening times: daily 10:00–23:00

Englischer Garten 3, 80538 Munich (station: "Gisela Straße" U3/U6 + bus 154, direction Bruno-Walter-Ring, exit Chinesischer Turm)

- **Seehaus** (in the English Garden at Kleinhesseloher Lake)

Opening times: daily 10:00–01:00

Kleinhesselohe 3, 80892 Munich (station: "Münchner Freiheit" U3/U6 + 15 minutes walk through the English Garden or station "Dietlindenstraße" U3/U6 + bus 144, direction Giesing Bahnhof, exit "Osterwaldstraße")

- **Augustiner Biergarten**

Opening times: daily 11:30–23:30

Arnulfstraße 52, 80335 Munich-Neuhausen (station: S-Bahn stations "Hauptbahnhof" or "Hackerbrücke", all S-Bahn lines)

- **Taxis Garten**

Opening times: daily 11:30– approx. 23:00

Taxisstraße 12, 80637 Munich (station: "Gern" U1)



ACCOMODATION

- The Munich International Trade Fair offers a Hotel Guide providing a large variety of accommodation possibilities. Whether near the Congress Center ICM or centrally located - you will find a comprehensive offer of accommodations in and around Munich meeting your personal criteria. The guide is available at: www.world-of-photonics.net/en/photonics-congress/travel-accomodation/your-stay/accommodation
- Well-prized student accommodations can be found at House International www.haus-international.de or at www.hostelworld.com/hostels/Munich

Hotel list

Rooms must be booked directly with the hotels or by using the above mentioned hotel guide. **Please note** that the room rates are taken from the homepages of the listed hotels. Rates may vary (e.g. during fairs) from the prices listed below according to room availability and reservation date. Please contact the hotel directly to make your reservation.

Hotels near the ICM

NH München Dornach ****

Address: Einsteinring 20
85609 Aschheim-Dornach

URL: <http://www.tagungshotel.com/hotel/1076685494.htm>

Email: reservations.muc@nh-hotels.com

Phone: +49 (0)89 99 34 56 77

Fax: +49 (0)89 99 34 56 79

Prices: 119 € - 159 € (excl. breakfast, 20 €)

Station: S2 Riem, then take bus 263 (direction Feldkirchen, exit Dornach, Erdinger Landstraße) or U2 Messestadt West, then take bus 264 (direction Riem, exit Dornach, Einsteinring Süd) 300m walking distance to the hotel

How to get to the ICM: Take bus 264 (direction Messestadt West, exit Am Messeseesee)

Best Western Hotel Erb **** (best if you arrive by car)

Address: Posthaltering 1
85599 Parsdorf/Munich

URL: <http://www.hotel-erb.de/default.aspx?lang=en>

Email: info@hotel-erb.de

Phone: +49 (0)89 99 11 00

Fax: +49 (0)89 99 11 01 55

Prices: 127 € - 144 € (excl. breakfast)

Breakfast: 13 €

Station: U2 Messestadt Ost, S2 Grub or Poing (2km from the hotel)

How to get to the ICM: The hotel offers a free bus shuttle to the trade fair; 23 - 26 May, but only twice a day (please see: www.hotel-erb.de/laser_world_of_photonics_2011_23_05_2011.aspx?lang=en).

Landhotel Martinshof *** (1km to the ICM)

Address: Martin-Empl-Ring 8,
81829 Munich-Riem

URL: <http://www.landhotel-martinshof.com/>

Email: info@landhotel-martinshof.com

Phone: +49 (0)89 92 20 80

Fax: +49 (0)89 92 20 84 00

Prices: 82 € - 125 € (incl. breakfast; 10 €)

Station: S2 Riem (600m walking distance to the hotel) or Messestadt West + bus 189 (direction Arabella park, exit Martin-Empl-Ring; goes every 20 minutes)

How to get to the ICM: Take bus 189 direction Messestadt West, exit Am Messeseesee (goes every 20 minutes.)

Hotel Gasthof zur Post (Aschheim)

Address: Ismaningerstrasse 11
85609 Aschheim bei Munich

URL: <http://www.gasthofpost-aschheim.de>

Email: info@gasthofpost-aschheim.de

Phone: +49 (0)89 90 04 80 0

Fax: +49 (0)89 90 04 80 48 0

Prices: 72 € - 125 € (excl. breakfast)

Breakfast: 7 €

Station: S2 Riem or U2 Messestadt West, then take bus 263 (direction Feldkirchen, exit Aschheim, Erdinger Straße)

How to get to the ICM: Take bus 263, direction Messestadt West, exit Am Messeseesee

Hotels in Munich, near underground U2

Exquisit Hotel **** (in the city centre)

Address: Pettenkoflerstrasse 3
80336 Munich

URL: <http://www.hotel-exquisit.com/>

Email: info@hotel-exquisit.com

Phone: +49 (0)89 55 19 90 0

Fax: +49 (0)89 55 19 94 99

Prices: 152 € - 305 € (incl. breakfast)

Station: Sendlinger Tor (U1, U2, U3, U6, U7, U8)

How to get to the ICM: Take underground U2, direction Messestadt Ost, exit Messestadt West (~ 20 minutes)

Hotel Meier City *** (in the city centre)

Address: Schützenstr. 12
80335 Munich

URL: <http://www.hotel-meier.de/>

Email: info@hotel-meier.de

Phone: +49 (0)89 549 03 40

Fax: +49 (0)89 549 03 43 40

Prices: 75 € - 155 € (incl. breakfast)

Station: Hauptbahnhof (U1, U2, U4, U5; all S-Bahn lines)

How to get to the ICM: Take underground U2, direction Messestadt Ost, exit Messestadt West (~ 22 minutes)

Hotel Müller*** (in the city centre)

Address: Fliegenstrasse 4
80337 Munich
URL: <http://www.hotel-mueller-muenchen.de/>
Email: info@hotel-mueller-muenchen.de
Phone: +49 (0)89 23 23 86 0
Fax: +49 (0)89 26 86 24
Prices: 119 € - 369 € (incl. breakfast)
Station: Sendlinger Tor (U1, U2, U3, U6, U7, U8)
How to get to the ICM: Take underground U2, direction Messestadt Ost, exit Messestadt West (~ 20 minutes)

Ibis Hotel München City ** (in the city centre)

Address: Dachauerstr. 21
80335 Munich
URL: www.ibishotels.com
Email: H1450@accor.com
Phone: +49 (0)89 55 19 30
Fax: +49 (0)89 55 19 31 02
Prices: 69 € - 169 € (incl. breakfast)
Station: Hauptbahnhof (U1, U2, U4, U5; all S-Bahn lines)
How to get to the ICM: Take underground U2, direction Messestadt Ost, exit Messestadt West (~ 22 minutes)

Hotel Dolomit ** (in the city centre)

Address: Goethestr. 11
80336 Munich
URL: www.hotel-dolomit.de
Email: info@hotel-dolomit.de
Phone: +49 (0)89 59 28 47
Fax: +49 (0)89 59 63 13
Prices: 49 € - 137 € (excl. breakfast)
Breakfast: 9.80 €
Station: Hauptbahnhof (U1, U2, U4, U5; all S-Bahn lines)
How to get to the ICM: Take underground U2, direction Messestadt Ost, exit Messestadt West (~ 22 minutes)

Acanthus-Hotel (in the city centre)

Address: An der Hauptfeuerwache 14
80331 Munich
URL: <http://www.acanthushotel.de/>
Email: info@acanthushotel.de
Phone: +49 (0)89 23 18 80
Fax: +49 (0)89 26 07 36 4
Prices: 93 € - 120 € (incl. breakfast)
Station: Sendlinger Tor (U1, U2, U3, U6, U7, U8)
How to get to the ICM: Take underground U2, direction Messestadt Ost, exit Messestadt West (~ 20 minutes)

Atlanta (in the city centre)

Address: Sendlinger Str. 58
80331 Munich
URL: <http://www.hotel-atlanta.de/>
Email: info@hotel-atlanta.de
Phone: +49 (0)89 26 36 05
Fax: +49 (0)89 26 09 02 7
Prices: 45 € - 180 € (excl. breakfast)
Breakfast: 7 €
Station: Sendlinger Tor (U1, U2, U3, U6, U7, U8)
How to get to the ICM: Take underground U2, direction Messestadt Ost, exit Messestadt West (~ 20 minutes)

Hotel Am Schatzbogen (in the east of Munich)

Address: Truderinger Str. 198
81825 Munich
URL: <http://www.hotel-am-schatzbogen.de/>
Email: info@hotel-am-schatzbogen.de
Phone: +49 (0)89 42 09 04 0
Fax: +49 (0)89 42 09 04 30
Prices: 109 € - 270 € (incl. breakfast)
Station: Trudering U2
How to get to the ICM: Take underground U2, direction Messestadt Ost, exit Messestadt West (~ 5 minutes)

House International - Student guest house (in the north of Munich)

Address: Elisabethstr. 87
80797 Munich
URL: <http://www.haus-international.de>
Email: info@haus-international.de
Phone: +49 (0)89 23 18 80
Fax: +49 (0)89 26 07 36 4
Prices: 48 € - approx. 90 € (incl. breakfast)
Station: Hohenzollernplatz U2, then take bus 53 (direction Aidenbachstraße) or tram 12 (direction Romanplatz), exit Barabarstraße
How to get to the ICM: Take bus 53 (direction Münchner Freiheit) or tram 12 (direction Scheidplatz), exit Hohenzollernplatz, then take underground U2, direction Messestadt Ost, exit Messestadt West (~ 30 minutes)

INFORMATION FOR AUTHORS AND ATTENDEES

ORAL PRESENTATIONS

Presentations shall be uploaded prior to the conference; details about format will follow later. This can be done online or - in exceptional cases - on-site (**1st floor**, Congress Centre "Speaker's check-in"). Authors will receive detailed information on the presentation upload (up-load link, log-in data, upload guide) about **four weeks** before the conference. All uploaded files will be destroyed after the conference. Authors are requested to come to the conference room well in advance of their presentation to check-in with the conference chair. All technical equipment (presentation computers, video projector, sound system, laser pointer) will be provided on-site. **It is not possible to use personal laptops.**

POSTER PRESENTATIONS

- Manufacturing of Optical Components (EOSMOC 2011): The official poster session will be held on **Tuesday, 24 May, 2011, 16:10-18:00.**
- Optofluidics (EOSOF 2011): The official poster session will be held on **Tuesday, 24 May, 2011, 16:00-18:00.**

Poster authors are requested to be present at their posters during the official poster session. Please **prepare and print** your poster in advance to the conference. Poster set-up and removal is in the responsibility of the authors. Any posters left on the boards at the close of the poster session will be discarded. Poster numbers will be displayed on the poster boards to show authors where to place their poster. Material for poster set-up (double sided tape and similar pads) will be provided by the organiser.

Poster size: The posters should have a size of DIN A1 (594 x 841 mm) or DIN A0 (841 x 1189 mm) preferably in a portrait format (not landscape format). The size of the poster boards is 100cm x 150cm (width x height).

WEB-DATABASE

The complete World of Photonics programme is available online at www.photonics-congress.com. The database offers versatile search functions and supports the composition of your individualized congress schedule that you can transmit to your PDA. The database provides information about all lectures and posters of a specific topic as well as the information about exhibitors at the show related to your inquiry!

OFFICIAL CONGRESS OPENING

The official congress opening including a Plenary Talk by **Günter Huber** (Universität Hamburg, Germany) will be on Monday morning, 23 May 2011, 09:30-11:00 (Room 1 (ground floor), Congress Centre). Please arrive well in advance to receive your badge and conference material at the EOS registration desk to avoid long waiting times.

EOS REGISTRATION DESK

Saturday, 21 May	15:30 - 18:00	
Sunday, 22 May	07:00 - 18:00	Attendees requiring a payment receipt or confirmation of attendance may obtain these
Monday, 23 May	07:00 - 18:00	documents onsite at the EOS registration desk. Attendees paying by cash are requested to
Tuesday, 24 May	07:00 - 18:00	have the exact change ready in euros.
Wednesday, 25 May	08:00 - 16:30	

REGISTRATION & FEES

At least one author of an accepted presentation is requested to register properly in advance to the conference. Your registration includes admission to all conferences of the World of Photonics Congress 2011 as well as to the LASER World of Photonics 2011 exhibition.

Registration category	Early-bird fee (until 29 April)	Late/on-site fee (from 30 April)
Early-bird registration for members *	490 € (incl. 19 % VAT)	570 € (incl. 19 % VAT)
Early-bird registration for non-members	610 € (incl. 19 % VAT)	690 € (incl. 19 % VAT)
Early-bird registration for student members * (the conference digest is <u>not</u> included; copy of student ID required)	105 € (incl. 19 % VAT)	150 € (incl. 19 % VAT)
Early-bird registration for student non-members (the conference digest is <u>not</u> included; copy of student ID required)	145 € (incl. 19 % VAT)	185 € (incl. 19 % VAT)
Early-bird registration for one-day (the conference digest is <u>not</u> included;	210 € (incl. 19 % VAT)	270 € (incl. 19 % VAT)

* **Member of:** EOS EPS SPIE OSA IEEE WLT German Competence Networks for Optical Technologies (OpTech-Net, Bayern Photonics, Hanse Photonik, OpTecBB, PhotonicNet, Photonics BW, OptoNet, Optence, PhotonAix)

EOS CONFERENCE PROCEEDINGS (CD-ROM)

The full-time registration fee (member/non-member) includes a CD-ROM (ISBN numbered) including the abstracts of all accepted and invited contributions of the 1st EOS Conference on Optofluidics (EOSOF 2011) and the 2nd EOS Conference on Manufacturing of Optical Components (EOSMOC 2011). **Please note** that one-day and student registrations do not include the digest CD-ROM. The digests may be purchased additionally (prices see table below).

The EOS does not publish conference proceedings with extensive papers. Authors who wish to publish in-depth papers are welcome to take advantage of the special publication offer for JEOS:RP (see the next paragraph). The publication offer for JEOS:RP is an option but no obligation.

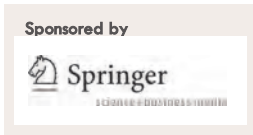
Extra EOS conference digest (CD-ROM)	Regular fee	Student fee
Including the complete volume of submitted abstracts of the 2nd EOS Conference on Manufacturing of Optical Components (EOSMOC 2011) and the 1st EOS Conference on Optofluidics (EOSOF 2011)	65 € (incl. 19 % VAT) member rate 75 € (incl. 19 % VAT) non-member rate	30 € (incl. 19 % VAT) (copy of student ID required)

JEOS:RP SPECIAL PUBLICATION OFFER



All attendees of Optofluidics (EOSOF 2011) and Manufacturing of Optical Components (EOSMOC 2011) receive a 20% discount on the publication rate for JEOS:RP (www.jeos.org). The paper must be an original contribution that is connected to one of the conference topics and must be submitted by 29 July, 2011. Special publication rates: 280 € (for members) / 320 € (for non-members).

BEST STUDENT PRESENTATION AWARD



The best student oral contribution and the best student poster presentation of each EOS Conference at the World of Photonics Congress 2011 will be awarded a diploma and a prize sponsored by Springer. All student oral and poster contributions are eligible to the prize. The criteria for the award are relevance, originality, scientific merit and clarity.

Notification to the Awardees: The winners of the Best Student Oral Presentation and Poster Presentation Award will directly be announced at the end of the last session of each EOS Conference on Wednesday, 25 May, 2011.

SPONSORING & ADVERTISING OPPORTUNITIES

Boost your visibility at the EOS Conferences on Manufacturing of Optical Components (EOSMOC 2011) and/or Optofluidics (EOSOF 2011) and - with some sponsoring opportunities - even at the whole World of Photonics Congress. Guide traffic to your booth at LASER World of Photonics or show your presence if you are not exhibiting.

- A list of sponsoring opportunities is provided at www.myeos.org/sponsoring_munich2011.
- To receive our **advertiser's and sponsor's guide** including all specifications and prices, please contact sales@ymeos.org, Phone: +49-(0)511-2788-159.

CAREER CENTER AT LASER WOLRD OF PHOTONICS 2011

Messe München offers in conjunction with **beratungsgruppe wirth + partner** career services for visitors free of charge. At the Career Center, a Jobboard is available for job advertisements. Concurrently, personnel consultants offer a career training for young professionals and professionally experienced engineers at the same location. You find the Career Center on the LASER World of PHOTONICS 2011 at Entrance West, Booth EW.700.

Further information about the **Career Center** is available at <http://world-of-photonics.net/link/en/21460028#21460028>.

Contact: Messe München GmbH, **Katrin Hirl**
Email: katrin.hirl@messe-muenchen.de | Phone: +49 (0)89 949 20325 | Fax: +49 (0)89 949 97 20325

INTERNET AREAS AND W-LAN LOUNGE



With your own laptop, you may use the free internet access on the ground floor as well as in the W-LAN-lounge on the 1st floor in the Foyer of the Congress Centre. When you enter the Congress Centre through the main entrance the W-LAN-Lounge is located on the left side of the Foyer. Thanks to our Sponsors W-LAN for EOS attendees is free of charge.

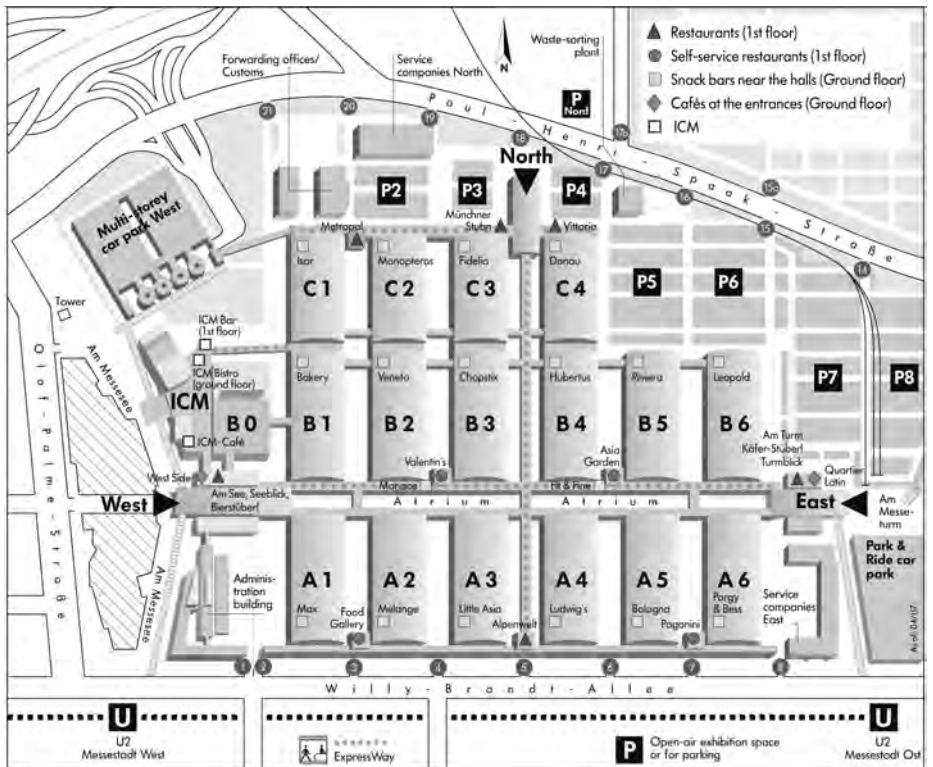
EOS AND PHOTONICS21 STUDENT RECEPTION

On Wednesday, 25 May, there will be held the EOS and Photonics21 Student Reception. More details will be announced later.

CATERING

All conference participants may attend the free coffee breaks. Lunch is not included in the registration fee.

A great number of bars and restaurants is available at the fairground (please see overview plan on the right).



FOREWORD BY THE GENERAL CHAIRS

Dear attendees of the Conference on Manufacturing of Optical Components,

Our 2nd EOS conference in Munich will highlight major research and development achievements within the expanding field of optical fabrication throughout Europe. High level contributions from research institutes, industry, and large science programs will provide an impressive coverage of new application demands. The conference will also provide a correspondingly impressive range of new processes that enable effective fabrication of numerous emerging “high value” products. These products provide a basis for the European manufacturing industry to compete with mass manufacturing bases throughout Asia.

This EOS conference will provide a global overview highlighting application areas that demand free form shape, diffractive and micro optics. In addition the growing demand for micro-structured optical surfaces employed on optical handling films and light diffusers will be presented.

The range of optic fabrication processes that will be reported will include conventional processes, such as the abrasive and single point diamond machining, yet in addition international reports of the increasingly employed energy beam and accretion “print type” processes will be provided. A growing range of optical materials employed will be identified through presentations dealing with fabrication matters associated with plastic based optical components.

We are especially proud to be able to complement the technical program with a session titled “*European Support Instruments*” with invited speakers. This session will provide high end information on established and upcoming European frameworks for optics manufacturers.

New measurement needs have arisen out of the increasing range of sophisticated optical components now being developed. Following the motto, ascribed to Galileo, “*what can not be measured can not be made*” the conference will set a focus on new metrology techniques specifically developed to cater for ever more complicated optical surfaces and assemblies. The “*Testing for Fabrication*” session will be run in association with the SPIE Optical Metrology conference.

It is our pleasure to welcome you to the 2nd EOS conference *Manufacturing of Optical Components* being held at the 20th International Congress on Photonics in Europe, in collaboration with LASER World of PHOTONICS.

General Chairs



Klaus-Friedrich Beckstette
Carl Zeiss AG Jena/Oberkochen (DE)



Paul Comley
Cranfield University (UK)

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SCIENTIFIC COMMITTEE & SUB-CONFERENCES

General Chairs



Klaus-Friedrich Beckstette
Carl Zeiss AG
Jena/Oberkochen (DE)



Paul Comley
Cranfield University (UK)

THEORETICAL AND PRACTICAL ASPECTS OF MANUFACTURING AND FINISHING TECHNOLOGIES

Chairs



Olaf Dambon
Fraunhofer-Institut für
Produktionstechnologie - IPT (DE)



Axel Schindler
Leibniz-Institut für
Oberflächenmodifizierung e.V. (DE)

OPTICS MANUFACTURING PROCESSES

Chair



Martin Forrer
FISBA OPTIK AG (CH)

OPTICAL MANUFACTURING FOR EMERGING PRODUCTS AND PROCESSES

Chairs



Stefan Bäumer
Philips Applied Technologies
Eindhoven (NL)



Wilhelm Ulrich
Carl Zeiss AG (DE)

TESTING FOR FABRICATION AND ASSEMBLY

This is a joint session between the EOS Conference „Manufacturing of Optical Components“ and the SPIE Europe Conference „Optical Metrology“

Chairs



Peter Lehmann
Universität Kassel (DE)



Guus Taminiau
Photonics Cluster Netherlands (NL)

EUROPEAN SUPPORT INSTRUMENTS FOR OPTICAL COMPONENTS MANUFACTURERS

Chairs



Pierre Chavel, CNRS
Institut d'Optique (FR)



Olivier Parriaux
Université St. Etienne (FR)

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- **Paul Shore**, Cranfield University (UK)
- **Reinhard Völkel**, SUSS MicroOptics SA (CH)
- **David Walker**, University College London, Glyndwr University and Zeeko Ltd. (UK)

INVITED SPEAKERS

Monday, 23 May 2011		Sub-conference: Theoretical and Practical Aspects of Manufacturing and Finishing Technologies
11:30 - 12:00		<p>Deterministic fabrication process for precision X-ray mirrors <u>Kazuto Yamauchi</u>; <i>Osaka University, Department of Precision Science & Technology and Applied Physics (JP).</i> We developed a deterministic fabrication process to realize precision X-ray mirrors to be used for sub-50nm focusing of synchrotron radiation hard X-rays. To reduce the beam size down to sub-10nm, we additionally developed an in-situ adaptive figuring method by using an x-ray interferometry. Details of them will be presented. (4328)</p>
Room: B21		
Tuesday, 24 May 2011		Sub-conference: Optics Manufacturing Processes
08:30 - 09:00		<p>Adjustment Turning of Inorganic-Metallic Mounted Optical Components <u>Ramona Eberhardt</u>¹, <i>E. Beckert</i>¹, <i>A. Gebhardt</i>¹, <i>C. Bruchmann</i>², <i>Th. Burkhardt</i>², <i>A. Tünnermann</i>^{1,2}; ¹<i>Fraunhofer Institute for Applied Optics and Precision Engineering (DE)</i>; ²<i>Friedrich-Schiller-University Jena (DE).</i> The presentation gives an overview about the joining technologies for optics and subsequently introduces a new concept for the precise and cost efficient manufacturing and assembly of modern optical sub-systems, especially precision lenses and multi-layered mirrors with their respective mounts. (4320)</p>
Room: B21		
Wednesday, 25 May, 2011		Sub-conference: Optical Manufacturing for Emerging Products and Processes
08:30 - 09:00		<p>High concentration photovoltaics: design and manufacturing challenges <u>Juan Carlos Miñano</u>^{1,2}, <i>P. Benítez</i>^{1,2}, <i>P. Zamora</i>¹; ¹<i>Universidad Politécnica de Madrid (ES)</i>; ²<i>LPI (US).</i> High Concentration Photovoltaics require an optical system with high efficiency, low cost and large tolerance. We show that a key point to achieve all these goals is a proper optical design adapted to the manufacturing technologies. (4379)</p>
Room: B21		
Sub-conference: European Support Instruments for Optical Components Manufacturers		
10:50 - 11:20		<p>Photonics in the EU: Opportunities and Challenges <u>Ronan Burgess</u>; <i>Deputy Head of the Photonics Unit, DG INFSO - European Commission (BE).</i> The talk will address developments in European photonics and the challenges that the research community and the industry are facing in a very competitive global market. In particular, the European Commission's strategy for Research, Development and Innovation in photonics will be highlighted. Topics that will be covered include: the role of photonics as one of Europe's Key Enabling Technologies, information on recent and upcoming calls for R&D proposals in the area as well as on the preparation of the new Framework Programme 8 and the potential role of photonics. (4433)</p>
Room: B21		
11:20 - 11:50		<p>EUMINAFAB - a European research infrastructure for micro-nano fabrication of functional structures and devices <u>Jürgen Mohr</u>; <i>Karlsruher Institute of Technology (KIT), Institute of Micro Structure Technology (DE).</i> Innovative ideas based on solutions using micro and nano fabrication technologies require access not only to high-end equipment but also to highly skilled personnel. Due to the complexity and diversity of micro and nano fabrication techniques, it is usually not possible for SMEs or even most research institutes. The European research infrastructure EUMINAFab (http://www.euminafab.eu/) seeks to overcome these barriers and provide researchers from throughout Europe with access to a specifically combined set of cutting edge technologies and expertise for structuring and characterising a multitude of different functional materials in dimensions from 100 microns down to several nanometres. Through peer reviewed scientific proposals access is given to the laboratories of the 10 EUMINAFab partners distributed over Europe. (4435)</p>
Room: B21		
11:50 - 12:20		<p>ACTMOST: supporting companies with "photonics technology services" instead of "money" <u>Hugo Thienpont</u>¹, <i>Malgorzata Kujawska</i>², <i>Juergen Mohr</i>³; ¹<i>Department of Applied Physics and Photonics, Vrije Universiteit Brussels (BE)</i>; ²<i>Institute of Micromechanics & Photonics, Warsaw University of Technology (PL)</i>; ³<i>Karlsruher Institute of Technology (KIT), Institute of Micro Structure Technology (DE).</i> Technology-driven innovation requires top-experts and expensive technology supply chains to turn novel concepts into practical products. Companies however – and in particular small- and medium-sized enterprises – often do not have direct access to such infrastructure. In addition the highly-skilled people that can operate these technology platforms are hard to find. In such cases high-technology becomes a show-stopper rather than a catalyst for product innovation, economic growth, and job creation. (4433)</p>
Room: B21		
Sub-conference: Testing for Fabrication and Assembly		
16:00 - 16:30		<p>Some challenges in shape measurement of optical freeform surfaces <u>Gunther Notni</u>; <i>Fraunhofer Institute for Applied Optics and Precision Engineering IOF (DE).</i> 3D metrology is one of the most challenging tasks in fabrication of optical freeforms. The requirements on accuracy and available measurement time strongly depend on the fabrication process itself. Therefore the fabrication and integration process mainly determines the choice of the measurement methods. (4422)</p>
Room: B21		

EOSMOC 2011 at a Glance

Monday, 23 May		Room
09:30-11:00	Official Congress Opening	1, Congress Centre
09:30	Words of Welcome by <i>Norbert Bargmann</i> , Deputy CEO of Messe München International (DE)	
09:35	Welcoming by <i>Georg Schütte</i> , State Secretary, Federal Ministry of Education and Research (BMBF) (DE)	
09:45	Welcoming by <i>Peter Loosen</i> , President of the Steering Committee, World of PHOTONICS Congress, Fraunhofer Institute for Laser Technology (DE)	
10:15	Opening Plenary Talk Solid-state lasers: Advances and prospects by <i>G. Huber</i> , Institute of Laser-Physics, Hamburg University (DE)	
11:20-11:25	EOSMOC 2011 - Conference Opening by the General Chair <i>Klaus-Friedrich Beckstette</i> , Carl Zeiss AG, Jena/Oberkochen (DE)	B 21, 1st floor, exhibition hall B2
Sub-conference:	Theoretical and Practical Aspects of Manufacturing and Finishing Technologies	B 21, 1st floor, exhibition hall B2
11:25-11:30	Welcome by Sub-conference Chairs <i>Olaf Dambon</i> , Fraunhofer Institute for Production Technology IPT (DE) <i>Axel Schindler</i> , IOM e.V. (DE)	
11:30-12:40	Session: Surface Finishing Aspects Invited Talk Deterministic fabrication process for precision X-ray mirrors <i>Kazuto Yamauchi</i> , Osaka University, Department of Precision Science & Technology and Applied Physics (JP)	
12:40-14:10	Lunch break	
14:10-15:30	Session: Asphere and Freeform Aspects	
15:30-16:00	Coffee break	
16:00-17:20	Session: Diamond Machining and Structuring Aspects	
18:00	Get together trade fair and congress	1, Congress Centre
Tuesday, 24 May		Room
Sub-conference:	Optics Manufacturing Processes	B 21, 1st floor, exhibition hall B2
08:25-08:30	Welcome by Sub-conference Chair <i>Martin Forrer</i> , FISBA OPTIK AG (CH)	
08:30-10:00	Morning Session Invited Talk Adjustment Turning of Inorganic-Metallic Mounted Optical Components <i>Ramona Eberhardt</i> , Fraunhofer Institute for Applied Optics and Precision Engineering (DE)	
10:00-10:30	Coffee break	
10:30-11:50	Noon Session	
11:50-14:00	Lunch break	
14:00-15:40	Afternoon Session	
15:40-16:10	Coffee break	
16:10-18:00	Poster Session	Foyer, 1st floor Congress Centre
17:45	Happy Hour	tba

Wednesday, 25 May		Room
Sub-conference:	Optical Manufacturing for Emerging Products and Processes	B 21, 1st floor, exhibition hall B2
08:25-08:30	Welcome by Sub-conference Chairs <i>Stefan Bäumer</i> , Philips Applied Technologies (NL) <i>Wilhelm Ulrich</i> , Carl Zeiss AG (DE)	
08:30-10:20	Optical Manufacturing for Emerging Products and Processes Invited Talk High concentration photovoltaics: design and manufacturing challenges <i>Juan Carlos Miñano</i> , Universidad Politécnica de Madrid (ES) & LPI (US)	
10:20-10:45	Coffee break	
Sub-conference:	European Support Instruments for Optical Components Manufacturers	B 21, 1st floor, exhibition hall B2
10:45-10:50	Welcome by Sub-conference Chairs <i>Pierre Chavel</i> , CNRS & Institut d'Optique (FR) <i>Olivier Parriaux</i> , Université St. Etienne (FR)	
10:50-12:40	European Support Instruments for Optical Components Manufacturers Invited Talks Photonics in the EU: Opportunities and Challenges <i>Ronan Burgess</i> , Deputy Head of the Photonics Unit, DG INFSO - European Commission (BE) EUMINAFAB - a European research infrastructure for micro-nano fabrication of functional structures and devices <i>Jürgen Mohr</i> , Karlsruhe Institute of Technology (KIT), Institute of Micro Structure Technology (DE) ACTMOST: supporting companies with "photonics technology services" instead of "money" <i>Hugo Thienpont</i> , Department of Applied Physics and Photonics, Vrije Universiteit Brussel (BE) Discussion	
12:40-14:00	Lunch break	
Sub-conference:	Testing for Fabrication and Assembly	B 21, 1st floor, exhibition hall B2
14:00-14:05	Welcome by Sub-conference Chairs <i>Peter Lehmann</i> , Universität Kassel (DE) <i>Guus Taminau</i> , Photonics Cluster Netherlands (NL)	
14:05-15:35	Session: Measurement of Optical Components and Systems I <i>Joint session with the SPIE Europe Conference, Optical Metrology'</i>  Invited Talk - SPIE Error influences in optical interferometry <i>M. Schulz</i> , Physikalisch-Technische Bundesanstalt (DE)	
15:35-16:00	Coffee break	
16:00-18:15	Session: Measurement of Optical Components and Systems II <i>Joint session with the SPIE Europe Conference, Optical Metrology'</i>  Invited Talk - EOS Some challenges in shape measurement of optical freeform surfaces <i>Gunter Notni</i> , Fraunhofer Institute for Applied Optics and Precision Engineering IOF (DE)	
18:15	End of EOSMOC 2011	

Room B21, 1st floor, Exhibition Hall B2

11:20

Conference Opening by the General Chair

K.-F. Beckstette, Carl Zeiss AG, Jena/Oberkochen (DE)

NOTES

11:25-17:20 SUB-CONFERENCE: THEORETICAL AND PRACTICAL ASPECTS OF MANUFACTURING AND FINISHING TECHNOLOGIES

Chairs: *O. Dambon*, Fraunhofer-Institut für Produktionstechnologie - IPT (DE)
A. Schindler, Leibniz-Institut für Oberflächenmodifizierung e.V. (DE)

11:25

Welcome by the Sub-conference Chairs

O. Dambon, Fraunhofer-Institut für Produktionstechnologie - IPT (DE)
A. Schindler, Leibniz-Institut für Oberflächenmodifizierung e.V. (DE)

11:30-12:40

SURFACE FINISHING ASPECTS

Chairs: *O. Dambon*, Fraunhofer-Institut für Produktionstechnologie - IPT (DE)
A. Schindler, Leibniz-Institut für Oberflächenmodifizierung e.V. (DE)

11:30

Invited Talk

Deterministic fabrication process for precision X-ray mirrors

K. Yamauchi; *Osaka University, Department of Precision Science & Technology and Applied Physics (JP)*.

We developed a deterministic fabrication process to realize *precision* X-ray mirrors to be used for sub-50nm focusing of synchrotron radiation hard X-rays. To reduce the beam size down to sub-10nm, we additionally developed an in-situ adaptive figuring method by using an x-ray interferometry. Details of them will be presented. (4328)

12:00

Ion Beam Figuring of crystalline optical materials

*M. Demmler*¹, *M. Zeuner*¹, *A. Luca*¹, *T. Dunger*¹, *D. Rost*¹, *S. Kiontke*², *M. Krüger*²;
¹*Roth & Rau MircoSystems GmbH (DE)*; ²*asphericon GmbH (DE)*.

The manufacture of lenses that are made of single crystalline materials is a lot more challenging than the manufacture of standard glass lenses. The following article describes an ion beam figuring process for the finishing of such lenses. Figuring results with a RMS < 10 nm will be shown. (4387)

12:20

Improved ion beam figuring technology using motion synchronized pulse width modulated ion beam control

*F. Pietag*¹, *A. Nickel*¹, *T. Hänsl*¹, *K. Nomura*², *A. Schindler*¹; ¹*Leibniz-Institut für Oberflächenmodifizierung, Leipzig, Physical Dept. (DE)*; ²*Nikon Corp., 1st R&D Section, Lens Engineering Development Department, Production Technology Headquarters, Core Technology Center (JP)*.

Ion beam figuring for ultra precision surface finishing is well established in high end optics fabrication. IBF standard dwell time technology shows some serious disadvantages especially to get highest accuracies for shape error reduction in millimeter spatial wavelength range. For the first time we demonstrate a new approach to overcome those restrictions for accuracy and efficiency. (4419)

12:40-14:10 Lunch break

Room B21, 1st floor, Exhibition Hall B2

14:10-15:30

ASPHERE AND FREEFORM ASPECTS

*Chairs: O. Dambon, Fraunhofer-Institut für Produktionstechnologie - IPT (DE)
A. Schindler, Leibniz-Institut für Oberflächenmodifizierung e.V. (DE)*

14:10

Precision machining of optical surfaces with small plasma jet tools

T. Arnold, H. Paetzelt, G. Böhm, M. Janietz, I.M. Eichentopf; Leibniz-Institut für Oberflächenmodifizierung e.V. (DE).

Atmospheric Ultra-Precision Plasma Jet Machining (UP-PJM) was used to modify fused silica, silicon and SiC with peak-to-valley (PV) accuracy in the nm range. As examples the processing of strongly curved SiC mirrors, a fine correction of a fused silica sample and a new deposition / transfer-technique for SiO_x are presented. (4360)

14:30

High-Rate Plasma Jet Machining for the Aspherization of Fused Silica Optics

G. Böhm, T. Arnold, H. Paetzelt, A. Schindler; Leibniz-Institute for Surface Modification (DE).

A high-rate plasma jet removal tool working at atmospheric pressure is used in the fabrication process of aspheres and free forms with large deformations. As examples the generation of a strongly curved concave plano-parabola and an off-axis plano-ellipse are presented starting from a plano-cylinder and a flat, respectively. (4338)

14:50

A closed look on essential parts of the polishing system in chemo-mechanical polishing

F. Klocke, D. Waechter, U. Schneider, O. Dambon; Fraunhofer Institute for Production Technology IPT (DE).

To meet future demands in direct optics manufacturing, stable and deterministic chemo-mechanical polishing processes are required. This work presents investigations on the polishing slurry and the polishing pad aiming for an enhancement of process stability and presents a process monitoring system. (4366)

15:10

Fast Design of Freeform Optics

R. Fessler, J. Jegorovs, N. Siedow, R. Wegener; Fraunhofer ITWM (DE).

The Fraunhofer Institute Techno- und Wirtschaftsmathematik (ITWM), Kaiserslautern, has developed a fast and robust algorithm for the design of freeform lenses and reflectors. The algorithm solves the inverse beam reshaping problem, namely it designs a lens or a reflector which realizes a prescribed light distribution on the screen for a given light source. (4356)

15:30-16:00 Coffee break

16:00-17:20

DIAMOND MACHINING AND STRUCTURING ASPECTS

*Chairs: O. Dambon, Fraunhofer-Institut für Produktionstechnologie - IPT (DE)
A. Schindler, Leibniz-Institut für Oberflächenmodifizierung e.V. (DE)*

16:00

Diamond Machining of Retroreflective Cube Corner Arrays

E. Brinksmeier, R. Gläbe, L. Schönemann; Laboratory for Precision Machining LFM, University of Bremen (DE).

Diamond machining is a key technology for many optical applications. However, these technologies are suffering from a strictly limited spectrum of machinable geometries. Current technologies like fast tool machining, additional machining axis for the ultraprecision machine tools and novel CAD/CAM software will help to extend the geometry spectrum. Nevertheless, discontinuous micro-structures are still difficult or impossible to machine. (4408)

16:20

Setpoint Generation Strategies for Freeform Machining

C. Brecher, C. Buss, C. Wenzel, D. Lindemann; Fraunhofer Institute for Production Technology (DE).

Fast tool servos are used for diamond machining of free form surfaces with optical quality which cannot be achieved by diamond milling or other cutting processes. A novel strategy for setpoint generation is presented which is integrated into the control system. This results in an increase of accuracy and versatility of fast tool systems. (4363)

NOTES

Room B21, 1st floor, Exhibition Hall B2

16:40

Diamond turning of meltspun aluminium for visual optical applications

G. Gubbels¹, R. Sender², X. Liu³; ¹TNO/Optics (NL); ²RSP Technology (NL); ³Aalto University (FI).

In a previous paper we reported about the use of rapidly solidified aluminium (RSA) for optical applications. RSA has a small sized grain structure enabling it to be diamond turned to low surface roughness values. This paper describes the diamond turning investigation for both RSA-6061 and RSA-905. We show that RSA-905 can be diamond turned to a surface roughness value of 2 nm Rq, (Higher Extrusion Ratio to about 1,5nm), while the RSA-6061 can be diamond turned to 1 nm Rq, provided that the proper post processing of the material after melt spinning is given. It is shown that the surface roughness values are influenced by mainly the amount and size of Mg₂Si precipitates that are present in the base material. Using an optimized processing to get the Mg₂Si precipitates better into solid solution enabled us to achieve 1 nm Rq surface roughness for the heat treatable RSA-6061, see Figure 1. We show, using a bidirectional reflectance distribution function measurement, that the RSA-6061 does not have to be post-polished. (4286)

17:00

STUDENT PRESENTATION

Expanding the applicability domain of phase-mask lithography of gratings to the extreme

*Y. Bourgin¹, Y. Jourlin¹, S. Tonchev^{1,2}, I. Vartiainen³, O. Parriaux¹, M. Kuittinen³, A. Talneau⁴; ¹University of Lyon, Lab. H. Curien UMR CNRS 5516 (FR); ²On leave from ISSP Bulgarian Academy of Sciences (BG); ³University of Eastern Finland, Department of Physics (FI); ⁴Lab. Photonique et Nanostructures, UPR CNRS 20 (FR); *ACTMOST Partners (www.actmost.eu).*

The applicability domain of phase-masks for the manufacturing of gratings is widely expanded by breaking the limits of a so far very narrow spatial frequency spectral width. This is a result of searching for high index deep-UV film materials and of resorting to a novel phase-mask scheme at the large period side. (4391)

18:00 **GET TOGETHER TRADE FAIR & CONGRESS**

1, Congress Centre

Open to all attendees of the World of Photonics Congress 2011 and all exhibitors of the LASER World of PHOTONICS.

NOTES

Room B21, 1st floor, Exhibition Hall B2

NOTES

08:25-15:40 SUB-CONFERENCE: OPTICS MANUFACTURING PROCESSES

Chair: M. Forrer, FISBA OPTIK AG (CH)

08:25

Welcome by the Sub-conference Chair

M. Forrer, FISBA OPTIK AG (CH)

08:30-10:00

MORNING SESSION

Chair: M. Forrer, FISBA OPTIK AG (CH)

08:30

Invited Talk

Adjustment Turning of Inorganic-Metallic Mounted Optical Components

R. Eberhardt¹, E. Beckert¹, A. Gebhardt¹, C. Bruchmann², Th. Burkhardt², A. Tünnermann^{1,2}; ¹Fraunhofer Institute for Applied Optics and Precision Engineering (DE); ²Friedrich-Schiller-University Jena (DE).

The presentation gives an overview about the joining technologies for optics and subsequently introduces a new concept for the precise and cost efficient manufacturing and assembly of modern optical sub-systems, especially precision lenses and multi-layered mirrors with their respective mounts. (4320)

09:00

Fully Automated Assembly of Micro Lenses for High Power Diode Lasers

H. Schröder¹, S. Marx¹, J. Meinschien², A. Timmermann², D. Goldberg², T. Vahrenkamp³, A. Weber³, B. Neumann⁴, S. Wright⁴, T. Westphalen⁵; ¹Fraunhofer IZM (DE); ²LIMO Lissotschenko Mikrooptik GmbH (DE); ³ficonTEC Service GmbH (DE); ⁴Artifex Engineering e.K. (DE); ⁵Fraunhofer ILT (DE).

We present a packaging process and a newly developed automated assembly system as proof of principle for high volume production. The system consists of a high precision handling system, metrology for process feedback, a powerful digital image processing system and tooling for glue dispensing, UV curing and laser operation. (4400)

09:20

STUDENT PRESENTATION

Wide phase-mask printing of large area gratings with proportionate investment costs

*Y. Bourgain¹, Y. Jourlin¹, P. Müller^{1,2}, B. Kress³, T. Kämpfe^{1,4}, I. Vartiainen⁵, M. Kuittinen⁵, O. Parriaux¹, B. Kley⁴; ¹*University of Lyon, Lab. H. Curien UMR CNRS 5516 (FR); ²University of Freiburg, Dpt. of Microsystems Engineering (DE); ³USI Inc. (US); ⁴Friedrich-Schiller-University Jena, Institute of Applied Physics (DE); ⁵*University of Eastern Finland, Department of Physics (FI); *ACTMOST Partners (www.actmost.eu)*

A large-grating printing strategy resorting to an unusually wide phase-mask carrying the essential characteristics of the grating spatial coherence defines a new manufacturing method where the needed investments only scale up slowly with the grating size, thus permitting the origination of grating areas beyond a one square meter area. (4388)

09:40

UV-cured glassy material for the manufacture of bulk and nano-structured elements

R. Gvishi¹, G. Sturm, A. Englander; Soreq, Applied Physics Division (IL).

A UV-cured glassy material based on sol-gel technology with organic residues of less than 30% was fabricated. The material presents high thermal stability, good optical quality and high adhesive strength. It can be used for optical bonding or for the manufacture of optical elements or micro-structured optical devices. (4322)

10:00-10:30 Coffee break

Room B21, 1st floor, Exhibition Hall B2

10:30-11:50

NOON SESSION

Chair: M. Forrer, FISBA OPTIK AG (CH)

NOTES

10:30

Dispensing and Printing of Polymer Optical Waveguides

M. Dumke¹, R. Rieske², D. Craiovan³, L. Overmeyer¹; ¹Leibniz Universität Hannover, Institute of Transport and Automation Technology (DE); ²Technische Universität Dresden, Electronics Packaging Laboratory (DE); ³Friedrich-Alexander-Universität Erlangen-Nürnberg, Institute for Manufacturing Automation and Production Systems (DE).

In the course of this article the process of dispensing polymer optical waveguides and the implementation into metallic components surfaces are described in detail. Furthermore, the letter press and aerosol-printing of polymer optical waveguides is explained. Here, preliminary results are shown exemplarily for letter press printing by using a Heidelberg Speedmaster printing machine and for aerosol-printing by using an Optomec-Aerosol Jet machine with pneumatic atomizer. (4373)

10:50

STUDENT PRESENTATION

Rapid prototyping of diffractive optical elements in microstructured sol-gel hybrid material

A. Chan Yong¹, K. Heggarty¹, C. Carre¹, D. Battarel²; ¹TELECOM Bretagne, Optics Dept., CNRS UMR 6082 FOTON (FR); ²HOLOTETRIX (FR).

TELECOM Bretagne and HOLOTETRIX Company fabricate diffractive optical elements in photoresist by direct-write through a reconfigurable mask. The project is to transfer microstructured patterns of photoresist element to sol-gel hybrid material. This material offers better properties than photoresist to make diffractive optics. (4376)

11:10

Precise processing of transparent dielectrics by pulsed laser radiation

K. Zimmer, R. Böhme, M. Ehrhardt, P. Lorenz; Leibniz-Institute of Surface Modification, Physics Department (DE).

This presentation gives an overview of the current status of advanced laser techniques for precise surface etching of transparent material. The main characteristics as the etching rate, the roughness, and the subsurface damage are discussed and selected examples for surface patterning/figuring are presented. (4347)

11:30

Fast 3D Figuring of Large Optical Surfaces Using Reactive Atom Plasma (RAP) Processing

R. Jourdain, M. Castelli, P. Morantz, P. Shore; Cranfield University Precision Engineering (UK).

This paper presents an investigation into the capability of reactive atom plasma (RAP) processing for figuring of large optical surfaces. Following identification and optimization of the main processing parameters, 500 nanometre deep spherical surfaces were etched into a 200x200mm fused silica substrate. The RAP processing time was optimised down to a 12 minute duration whilst achieving surface figure error of 31nm RMS. (4413)

11:50-14:00 Lunch break

Room B21, 1st floor, Exhibition Hall B2

14:00-15:40

AFTERNOON SESSION

Chair: M. Forrer, FISBA OPTIK AG (CH)

14:00

Removal of Mid Spatial-Frequency Features in Mirror SegmentsG. Yu¹, H. Li^{1,2}, D. Walker^{1,2,3}; ¹Optic Glyndwr, Ffordd William Morgan (UK);²University College London, Dept. Physics and Astronomy (UK); ³Zeeko Ltd (UK).
The primary mirror of the European Extremely Large Telescope (E-ELT), under development by the European Southern Observation (ESO), will consist of 984 hexagonal segments of 1.234m across the flats. (4289)

14:20

Diamond turning of freeform telescope mirrors for TROPOMIG. Gubbels, R. Henselmans, B. van Venrooy, P. van Doorn; TNO Science and Industry (NL).

The Ozone Monitoring Instrument OMI was launched on the EOS-Aura mission in 2004. It contains a push broom telescope with a wide field of view, sweeping over the earth surface with global daily coverage. The telescope combines an unsurpassed wide field of view (114°) with high image quality. The two-mirror telescope has a pupil and an intermediate image in between the mirrors, and images an elongated swath on the earth surface on a spectrometer slit, the image being telecentric. The Tropospheric Monitoring Instrument TROPOMI is its successor, which is currently under development by KNMI, SRON, Dutch Space, TNO and NSO. (4302)

14:40

STUDENT PRESENTATION

Laser polishing of spherical quartz lensesA. Richmann¹, E. Willenborg², K. Wissenbach²; ¹RWTH Aachen University, Lehrstuhl für Technologie Optischer Systeme (DE); ²Fraunhofer Institute for Laser Technology ILT (DE).By laser polishing of plane quartz substrates a roughness of $R_q = 15$ nm can be achieved. The micro roughness is lower than for most conventional polished samples. The processed area per time is 1 cm²/s. Recent results on polishing of spherical lenses with the same polishing results are reported. (4303)

15:00

STUDENT PRESENTATION

Mould fabrication for polymer opticsM. Speich, R. Börret; Aalen University, Centre of Optical Technology (DE).

Mass production of optical components is enabled by replication methods like injection moulding. We use a new economic process chain for the machining of the necessary moulds with different geometries to achieve the optical surface. In the new economic process chain the nickel plating, the diamond turning and the manual polishing are replaced by robot polishing. (4283)

15:20

STUDENT PRESENTATION

Dwell time assisted grindingC. Vogt, H. Adelsberger, R. Maurer, F. Schneider, T. Koller, S. Draxinger, S. Sinzinger, R. Rascher, P. Sperber; University of Applied Sciences Deggendorf, Laboratory "Optical Engineering" (DE); University of Ilmenau, Lighting engineering and Optics (DE).

This paper reports on a testing series with different feedrates in grinding optical shapes using silicon carbide based ceramics. Effects on the depth of cut according to CCOS (computer controlled optical surfacing) are presented and discussed. (4324)

15:40-16:10 Coffee break

16:10-18:00

POSTER SESSION

For the Poster Presentations please see pages 25-29

Foyer, 1st floor,
Congress Centre

17:45

HAPPY HOUR

Location tba

NOTES

Room B21, 1st floor, Exhibition Hall B2

NOTES

08:25-10:20 SUB-CONFERENCE: OPTICAL MANUFACTURING FOR EMERGING PRODUCTS AND PROCESSES

Chairs: Stefan Bäumer, Philips Applied Technologies (NL)
Wilhelm Ulrich, Carl Zeiss AG (DE)

08:25

Welcome by the Sub-conference Chairs

Stefan Bäumer, Philips Applied Technologies (NL)
Wilhelm Ulrich, Carl Zeiss AG (DE)

08:30

Invited Talk

High concentration photovoltaics: design and manufacturing challenges

J.C. Miñano^{1,2}, P. Benítez^{1,2}, P. Zamora¹; ¹Universidad Politécnica de Madrid (ES); ²LPI (US).

High Concentration Photovoltaics require an optical system with high efficiency, low cost and large tolerance. We show that a key point to achieve all these goals is a proper optical design adapted to the manufacturing technologies. (4379)

09:00

E-ELT optics production: Challenges & results on proto demonstration

M.R. Geyl; SAGEM (FR).

After the 8-m aperture VLT telescopes and 11-m Gran Telescopio Canarias, the European Extremely Large Telescope (E-ELT) with its 42-m aperture constitutes the next giant step in the domain of large astronomical optical ground telescope. (4377)

09:20

Wafer Level Manufacturing of Glass Optics

F. Klocke, O. Dambon, D. Hollstegge, M. Hüntgen; Fraunhofer Institute for Production Technology - IPT (DE).

The wafer-based manufacturing approach, which perfectly uses the economics of scale, is already established for polymer optics. In this work, the manufacturing approach for glass optics molded on a wafer scale is presented and a view is given on the process steps that have to be accomplished. (4353)

09:40

Grating phase-mask lithography for subwavelength radial polarizer fabrication

*Y. Jourlin¹, C. Veillas¹, S. Tonchev^{1,2}, J. Sauvage-Vincent¹, U. Zeitner³, O. Parriaux¹; ¹University of Lyon, Lab. H. Curien UMR CNRS 5516 (FR); ²on leave from the ISSP Bulgarian Academic of Science (BG); ³Fraunhofer Institut für Angewandte Optik und Feinmechanik IOF (DE); *ACTMOST Partners (www.actmost.eu).*

The grating manufacturing technology using a phase-mask is here expanded to the fabrication of circularly symmetrical gratings of radial periodicity with exposure by means of an incident beam of azimuthal polarization. The application example is a radial polarizer for the 442 nm line of an HeCd laser. (4394)

10:00

MEMS based dual-axis confocal fluorescence handheld microscope

W. Piyawattanametha¹⁻³, M.J. Mandella³; ¹National Electronics and Computer Technology Center (TH); ²Faculty of Medicine, Chulalongkorn University (TH); ³Department of Pediatrics, Stanford University School of Medicine (US).

We present a MEMS-scanner-based Dual-Axis-Confocal (DAC) handheld microscope in 10 mm diameter package capable of 3-D in vivo real-time imaging. The endoscope achieves FWHM transverse and axial resolutions of 4.2 μm and 7 μm , respectively. (4326)

10:20-10:45 Coffee break

Room B21, 1st floor, Exhibition Hall B2

10:45-12:40 SUB-CONFERENCE: EUROPEAN SUPPORT INSTRUMENTS FOR OPTICAL COMPONENTS MANUFACTURERS

Chairs: Pierre Chavel, CNRS & Institut d'Optique (FR)
Olivier Parriaux, Université St. Etienne (FR)

10:45
Welcome by the Sub-conference Chairs

Pierre Chavel, CNRS & Institut d'Optique (FR)
Olivier Parriaux, Université St. Etienne (FR)

10:50 Invited Talk

Photonics in the EU: Opportunities and Challenges
R. Burgess, Deputy Head of the Photonics Unit, DG INFSO - European Commission (BE).

The talk will address developments in European photonics and the challenges that the research community and the industry are facing in a very competitive global market. In particular, the European Commission's strategy for Research, Development and Innovation in photonics will be highlighted. Topics that will be covered include: the role of photonics as one of Europe's Key Enabling Technologies, information on recent and upcoming calls for R&D proposals in the area as well as on the preparation of the new Framework Programme 8 and the potential role of photonics. (4433)

11:20 Invited Talk

EUMINAFAB - a European research infrastructure for micro-nano fabrication of functional structures and devices
J. Mohr, Karlsruhe Institute of Technology (KIT), Institute of Micro Structure Technology (DE).

Innovative ideas based on solutions using micro and nano fabrication technologies require access not only to high-end equipment but also to highly skilled personnel. Due to the complexity and diversity of micro and nano fabrication techniques, it is usually not possible for SMEs or even most research institutes. The European research infrastructure EUMINAFab (<http://www.euminafab.eu/>) seeks to overcome these barriers and provide researchers from throughout Europe with access to a specifically combined set of cutting edge technologies and expertise for structuring and characterising a multitude of different functional materials in dimensions from 100 microns down to several nanometres. Through peer reviewed scientific proposals access is given to the laboratories of the 10 EUMINAFab partners distributed over Europe. (4435)

11:50 Invited Talk

ACTMOST: supporting companies with "photonics technology services" instead of "money"
H. Thienpont¹, M. Kujawinska², J. Mohr³; ¹Department of Applied Physics and Photonics, Vrije Universiteit Brussel (BE); ²Institute of Micromechanics & Photonics, Warsaw University of Technology (PL); ³Karlsruher Institute of Technology (KIT), Institute of Micro Structure Technology (DE).

Technology-driven innovation requires top-experts and expensive technology supply chains to turn novel concepts into practical products. Companies however – and in particular small- and medium-sized enterprises – often do not have direct access to such infrastructure. In addition the highly-skilled people that can operate these technology platforms are hard to find. In such cases high-technology becomes a show-stopper rather than a catalyst for product innovation, economic growth, and job creation. (4433)

12:20 **Discussion**

12:40-14:00 Lunch break

NOTES

Room B21, 1st floor, Exhibition Hall B2

14:00-18:15 SUB-CONFERENCE: TESTING FOR FABRICATION AND ASSEMBLY

Chairs: Peter Lehmann, Universität Kassel (DE)
Guus Taminiaw, Photonics Cluster Netherlands (NL)



Joint session with the SPIE Europe Conference *Optical Metrology*.

NOTES

14:00

Welcome by the Sub-conference Chairs

Peter Lehmann, Universität Kassel (DE)
Guus Taminiaw, Photonics Cluster Netherlands (NL)

14:05-15:35

MEASUREMENT OF OPTICAL COMPONENTS AND SYSTEMS I

Chairs: Peter Lehmann, Universität Kassel (DE)
Guus Taminiaw, Photonics Cluster Netherlands (NL)

14:05

SPIE Europe Some aspects of error influences in interferometric measurements of optical surface forms

Invited Talk

M. Schulz, Physikalisch-Technische Bundesanstalt (DE).

Abstract tba

14:35

STUDENT PRESENTATION

EOS Diffractive simultaneous lateral shearing interferometry

V. Nercissian¹, I. Harder², K. Mantel², A. Berger¹, N. Lindlein¹; ¹Friedrich-Alexander University of Erlangen-Nürnberg, Institute for Optics, Information and Photonics (DE); ²Max Planck Institute for the Science of Light (DE).

A lateral shearing interferometer, based on diffractive gratings, simultaneously provides the two slope data sets needed for the complete reconstruction of a wave front under test. Presented are two possible realizations, using a polarization signature and a partially coherent light source. (4295)

14:50

EOS Aspherical Surface Measurement using Quadri-Wave Lateral Shearing Interferometry

W. Boucher, P. Delage, B. Wattellier; PHASICS S.A., XTEC (FR).

Aspherical surfaces are characterized in reflection using a quadri-wave lateral shearing interferometer (QWL). This measures the deformation of a reference source due to the reflection on an aspherical shape. Thanks to the wave front sensor high dynamic range, aspherization sags larger than 100 μm are easily achieved. (4348)

15:05

EOS Advances studies on the measurement of aspheres and freeform surfaces with the Tilted-wave Interferometer

E. Garbusj, G. Baer, W. Osten; Institut für Technische Optik, Universität Stuttgart (DE).

The accurate and flexible characterization of aspheric and freeform surfaces is a key element in the further development of cost-effective production systems for such optical surfaces. This work presents the latest results in the measurement of aspheres and freeform surfaces with the tilted-wave interferometer. (4319)

15:20

SPIE Europe A subaperture stitching algorithm for aspheric surfaces,

P.-C. Lin¹, Y.-C. Chen¹, C.-W. Liang¹, C.-M. Lee²; ¹National Central University (TW); ²California State University (US).

This study aims to develop a subaperture stitching algorithm for testing aspheric surfaces with more than 1000-wave departure from the best-fit sphere. The proposed measuring scheme is to divide the full aperture into one central circular region plus several partially-overlapping annuli, measure the phase maps at small subapertures in each annulus by phase-shifting interferometry, and stitch all the subapertures together to reconstruct the whole surface. In order to have resolvable interference fringes in each subaperture, optical null is accomplished by introducing proper amounts of tilt and defocus between the reference and the object wavefronts.

15:35-16:00 Coffee break

Room B21, 1st floor, Exhibition Hall B2

16:00-18:15

MEASUREMENT OF OPTICAL COMPONENTS AND SYSTEMS II

Chairs: Peter Lehmann, Universität Kassel (DE)

Guus Taminau, Photonics Cluster Netherlands (NL)

16:00

Invited Talk

EDS Some challenges in shape measurement of optical freeform surfaces*G. Notni; Fraunhofer Institute for Applied Optics and Precision Engineering IOF (DE).*

3D metrology is one of the most challenging tasks in fabrication of optical free-forms. The requirements on accuracy and available measurement time strongly depend on the fabrication process itself. Therefore the fabrication and integration process mainly determines the choice of the measurement methods. (4422)

16:30

SPIE Europe Axicon metrology using high-line density computer-generated holograms*J. Ma^{1,2}, C. Pruss¹, M. Häfner¹, R. Zhu², Z. Gao², C. Yuan¹, W. Osten¹; ¹University of Stuttgart (DE); ²Nanjing University of Science & Technology (CN).*

Axicon surfaces are widely used in nowadays optical system design. This rotationally symmetric, cone shaped element allows concentrating light along a large portion of the optical axis and thus enables systems with a long focal depth. This advantage is exploited in many applications, such as laser machining, optical testing, laser beam shaping and laser resonator design.

16:45

EDS 3D-profilometry on aspheric and freeform lenses*A. Beutler; Mahr GmbH (DE).*

A new type of machine setup combining a profilometer with a rotational measuring axis to measure aspheric lenses is presented. The instrument is very flexible, as it does not need a specific hologram for each type of asphere. In general, the setup is also capable to measure freeforms. Metrology strategies and first results are presented. (4369)

17:00

STUDENT PRESENTATION

EDS Measurements of aberrations of aspherical lenses using experimental ray tracing*U. Ceyhan¹, T. Henning¹, F. Fleischmann¹, D. Hilbig¹, D. Knipp²; ¹University of Applied Sciences Bremen, I3M (DE); ²Jacobs University, Electrical Engineering (DE).*

An experimental ray tracer for measuring the optical aberrations of aspherical lenses is presented. This method has the potential to be used in aspheric lens testing because of its flexibility and high dynamic range. Preliminary results with an aspherical lens are compared with those obtained by a commercial surface profiler. (4291)

EDS 17:15

Automated alignment of aspheric and freeform surfaces in non-null test interferometry

G. Baer, E. Garbusi, W. Lyda, W. Osten; Institut für Technische Optik, Universität Stuttgart (DE).

An automatic method for the positioning of a test surface in a non-null interferometer is presented. In this work the effect on the measurement due to misalignments of the test surface (aspheres and freeforms) is studied and an adjustment strategy for the positioning of the surface at a predefined measurement location developed. (4308)

NOTES

Room B21, 1st floor, Exhibition Hall B2

17:30

SPIE Europe Complete characterization of assembled optics with respect to centering error and lens distances

J. Heinisch, P. Langehanenberg, H. Pannhoff; Trioptics GmbH (DE).

The position of optical surfaces and elements in the final assembly of an optical system has a strong influence on the imaging quality of the system itself. Therefore the precise and accurate alignment of lenses and optical elements is becoming more and more crucial. After the assembly of the complete optics is finished it is difficult to check the centration error and the distances of the single optical elements. We will describe a technique to measure the lateral displacement of each centre or curvature with respect to a given reference axis with 0.1 micron accuracy. Additionally it is possible to measure the distances between surfaces of the assembled optics with an accuracy of 1 micron. The measurement is based on the combination of a focusing autocollimator and a short coherence interferometer. The measurement is non destructive and can be applied to optical systems with several optical elements (typically 20 lenses).

17:45

SPIE Europe Interferometric measurement of profile deviations of large precision mirrors

A. Müller, G. Jäger, E. Manske; Technische Universität Ilmenau (DE).

In numerous interferometric applications of nanopositioning and nanomeasuring technology, plane mirrors are used as flatness or straightness standards for the movement of a positioning device. During this process, the shape deviations of the mirrors used lead to systematic errors of the position measurements, which can be corrected in later applications if known. Most often the effective shape deviations are described sufficiently well by profile deviations along a profile line which is fixed by the movement of the positioning or measuring device.

18:00

EOS HRIM Measuring amplitude and phase of light emerging from microstructures with HRIM

M.-S. Kim, T. Scharf, H.P. Herzig; Ecole Polytechnique Fédérale de Lausanne (EPFL), Optics & Photonics Technology Laboratory (CH).

Ultra high-resolution measurements of amplitude and phase field distributions emerging from a 1- μm -period amplitude grating are presented and discussed. In the axial direction periodically repeated features are found, whose origins are the Talbot effect within the Fresnel diffraction regime. Filtering diffraction orders in the back focal plane of the observing objective provides specific Talbot images and allows to intuitively understand the role of diffraction orders in this phenomenon. (4342)

18:15 End of the 2nd EOS Conference on Optical Manufacturing (EOSMOC 2011)

NOTES

POSTER SESSION | Tuesday, 24 May, 16:10-18:00 | Foyer, 1st Floor, Congress Centre

SUB-CONFERENCE:
THEORETICAL AND PRACTICAL ASPECTS OF MANUFACTURING AND
FINISHING TECHNOLOGIES

NOTES

MOC_AMFT_4293_01

The dependence of the 1st order diffraction efficiency on the structures of binary diffractive lens with the 100 μm -order-focal lengths on a PET film

A. Motogaito^{1,2}, K. Arakawa¹, H. Miyake^{1,2}, K. Hiramatsu^{1,2}; ¹Graduate School of Engineering, Mie University (JP); ²The Center of Ultimate Technology on nano-Electronics, Mie University (JP).

To realize of the binary diffractive lens with the 100 μm -order-focal lengths, the relationship between the diffractive lens structure and its light distribution is characterized. To enhance the 1st order diffraction, the optimum height of lens is existed.

MOC_AMFT_4294_02

Fabrication and characterization of the binary diffractive concave lens with 2 mm-focal-length on a Cyclic Olefin Polymer film

A. Motogaito^{1,2}, Y. Seriguchi¹, H. Miyake^{1,2}, K. Hiramatsu^{1,2}, H. Yoshino³; ¹Graduate School of Engineering, Mie University (JP); ²The Center of Ultimate Technology on nano-Electronics, Mie University (JP); ³Precision Processing Research Laboratories, JSR Corporation (JP).

To spread laser or LED light widely, the fabrication of the binary diffractive concave lens on the cyclic olefin polymer film with the 2 mm-order-focal lengths is carried out. By using the binary diffractive concave lens, the laser light can spread widely. In order to the 1st order diffraction, the optimum structure is existed.

MOC_AMFT_4343_04

Analytical solution for the distribution of scattering elements in edge-lit backlight units.

M. Kusko, C. Kusko, D. Cristea; IMT-Bucharest (RO).

In this paper we present a theoretical framework for finding the optimum distribution of scattering elements in an edge-lit light guide plate (LGP) for rendering an uniform luminance of the outcoupled light in back light unit displays.

MOC_AMFT_4352_05

STUDENT PRESENTATION

Direct laser fabrication of blaze gratings in fused silica

M. Pfeifer, S. Weissmantel, G. Reisse; University of Applied Sciences Mittweida (DE).

Results of our investigations on direct laser fabrication of blaze gratings in fused silica using a special mask projection technology will be presented. In particular, it will be shown that gratings with nearly optimum blaze geometry and relatively low surface roughness of the reflecting areas can be produced.

MOC_AMFT_4361_06

Data Handling in Modern Optics Manufacturing Processes

T. Bobek, C. Zymła, L. Glasmacher; Fraunhofer Institute of Production Technology, CAx Technologies (DE).

In the field of high precision freeform optic manufacturing, the data flow of process and work-piece data throughout the complete process chain is studied focusing onto the consistency and precision of the relevant data.

MOC_AMFT_4397_07

Correction of Sub-Millimeter Spatial Wavelength Polishing Errors by Atmospheric Plasma Jet Machining

H. Paetzelt¹, G. Böhm¹, Th. Arnold¹, M. Weiser², N. Kaier³, A. Schindler¹; ¹Leibniz-Institut für Oberflächenmodifizierung e.V. (DE); ²Carl Zeiss SMT GmbH (DE); ³Carl Zeiss Jena GmbH (DE).

Fine-focused atmospheric plasma jet machining (APJM) has been investigated for mid spatial frequency correction of optical surfaces (made of materials such as fused silica, Zerodur or ULE®). Plasma tool characteristic (etching rate, half width, ...) and process parameters (gas flow, scanning speed, ...) are presented in detail for two microwave (2.45 GHz) powered Ar/He plasma systems with CF₄ as reactive process gas component.

POSTER SESSION | Tuesday, 24 May, 16:10-18:00 | Foyer, 1st Floor, Congress Centre

MOC_AMFT_4398_08

Replica Molding of Optical Components in Polymers

P. Obreja, A. Dinescu, M. Kusko, A.C. Obreja, D. Cristea; National Institute for R&D in Microtechnologies (IMT-Bucharest) (RO).

The paper presents the replicas for the optical components obtained in different polymers (epoxy resin, PMMA and PDMS). The aim of our experiments was to improve the quality of the replicas and to apply the replica molding in micro/nanofabrication of the components at wafer scale.

MOC_AMFT_4390_09

Rehabilitation of wet etching for the low-cost manufacturing of highly selective subwavelength gratings of high efficiency

*S. Tonchev^{1,2}, T. Kämpfe¹, O. Parriaux¹; ¹University of Lyon, Lab. H. Curien UMR CNRS 5516 (FR); ²On leave from ISSP Bulgarian Academy of Sciences (BG); *ACTMOST Partners (www.actmost.eu).*

Beside giving rise to high optical contrast effects and high-selectivity filtering, resonant DOE and grating elements lend themselves, and for the same reason related to the existence of resonances, to a manufacturing technology resorting to very low cost plain old wet etching processes even for submicron features.

MOC_AMFT_4392_10

Holistic fabrication of stitchingless subwavelength cylindrical gratings by phase-mask coordinate transform

*S. Tonchev^{1,2}, N. Lyndin¹, Y. Jourlin¹, F. Celle¹, O. Parriaux¹, M. Kuittinen³, J. Laukkanen³; ¹University of Lyon, Lab. H. Curien UMR CNRS 5516 (FR); ²on leave from the ISSP Bulgarian Academic of Science (BG); ³University of Eastern Finland, Department of Physics (FI); *ACTMOST Partners (www.actmost.eu).*

A periodic grating with integer number of periods is fabricated at the resist-coated wall of a cylinder by exposing a circularly symmetrical planar high-index phase-mask to a cylindrical wave. This allows a transposition of the spatial coherence features easily achieved in a planar 2D space to the 3D space of cylindrical waves and elements.

NOTES

**SUB-CONFERENCE:
OPTICS MANUFACTURING PROCESSES**

MOC_OMP_4386_11

Double-sided exposure for large blaze-angle saw-tooth grating manufacturing

*S. Tonchev; Institute of Solid State Physics, Bulgarian Academy of Sciences (BG); *On leave at University of Lyon, Lab. H. Curien UMR CNRS 5516 (FR); *ACTMOST Partners (www.actmost.eu).*

Saw tooth gratings with strong asymmetry are shown to be manufacturable in a photoresist layer by exposing the resist-coated substrate from both sides without any post-processing.

MOC_OMP_4389_12

Specific exposure and photochemistry on dissolvable 3D-PMMA microoptical masters with resist surface grating

*S. Tonchev^{1,2}, O. Parriaux¹, M. Wissmann³, M. Guttman³, J. Mohr³, J. Krezel⁴, M. Kujawinska⁴; ^{1,2}University of Lyon, Lab. H. Curien UMR CNRS 5516 (FR); ²On leave from ISSP Bulgarian Academy of Sciences (BG); ³Karlsruhe Institute of Technology (DE); ⁴Institute of Micromechanics and Photonics (PL); *ACTMOST Partners (www.actmost.eu).*

A set of shaping, photochemical and interferogram exposure processes opens the way to the origination of high geometrical quality 3D microoptic element with diffractive faces allowing a damageless separation between nickel shim of concave geometry and the master by chemical dissolution of the latter.

MOC_OMP_4269_13

Freeform correction for molding high precision plane optical surfaces

L. Dick; Jenoptik Polymer Systems GmbH (DE).

The poster will describe an innovative process chain for manufacturing high precision plane optical surfaces realised with injection molding by correction of the asymmetric polymer shrinkage with a freeform surface at the tool insert. This process minimizes the form deviation at the molded plane optical surface from 12,6 µm down to about 1 µm p-v at the optical active area which is an order of magnitude.

POSTER SESSION | Tuesday, 24 May, 16:10-18:00 | Foyer, 1st Floor, Congress Centre

MOC_OMP_4282_14

STUDENT PRESENTATION

NOTES

Differentiation of influences in deterministic polishing*A. Kelm¹, R. Boerret¹, S. Sinzinger²; ¹HTW Aalen (DE); ²TU Ilmenau (DE).*

The polishing process on rotation symmetric surfaces often is used to smooth the surface and eliminate tool marks generated by grinding. Three different effects, variation of relative velocity, variation of friction coefficient, edge effects, that have influence on the polishing removal are discussed and experimentally verified.

MOC_OMP_4290_15

STUDENT PRESENTATION

Modelling and measurement of polishing tool influence functions for edge control*H. Li^{1,2}, R. Evans², G. Yu², D. Walker^{1,2,3}; ¹University College London, Dept. of Physics and Astronomy (UK); ²Optic Glyndwr, Ffordd William Morgan (UK); ³Zeeko Ltd, Coalville (UK).*

This paper reports on part of a development programme addressing fabrication of mirror segments for extremely large telescopes. Computer controlled corrective polishing using Zeeko's bonnet polishing technology and Precessions numerical optimisation, requires accurate tool influence function data. Stability and determinism of the influence functions are crucial for successful form-correction. Particular challenges arise when polishing up to edges, and correcting edge-profiles, because the geometry of the influence function created by an inflated bonnet changes as it encroaches the edge.

MOC_OMP_4327_16

Design and fabrication 1-D electrostatically actuated torsional MEMS micro-mirror based on SU-8*M. Khalafi¹, H. Latifi¹, M. Ghaderi¹, I. Sabri¹, A. Moazenzadeh^{1,2}; ¹Shahid Beheshti University, Laser and Plasma Research Institute and Department of Physics (IR); ²Present address: University of Freiburg, The Institute of Microsystem Technology, (IMTEK) (DE).*

This paper presents a model to design and fabricate 1-D torsional micro-mirror which is made by SU-8 photoresist. The torsional micro-mirror consists of a mirror plate, bases for installing mirror, and two electrodes. Mirror plate and bases were made by SU-8. The torsional angle and deflection tests were studied and results were shown below.

MOC_OMP_4349_17

Laser-induced front side and back side etching of fused silica with KrF and XeF excimer lasers using metallic absorber layers: A comparison*P. Lorenz, M. Ehrhardt, K. Zimmer; Leibniz-Institut für Oberflächenmodifizierung e.V. (DE).*

Laser-induced front side and back side etching is a method for nanometer-precision laser etching of transparent materials by using thin absorber layers. For fluences up to 5 J/cm², the chromium metal layer-induced back side and front side etching results in equal surface morphologies and etching depths at certain parameters.

MOC_OMP_4372_18

STUDENT PRESENTATION

Investigation of CAD/CAM Supported Freeform Grinding on State-of-the-Art 5-Axis Optic Machine Centers*J. Bliedner¹, M. Wagner², C. Schindler^{1,2}; ¹University of Applied Sciences Jena, Department SciTec (DE); ²Satisloh GmbH, Precision Optics (DE).*

A process chain for freeform grinding based on CAD/CAM systems has been created. We applied grinding technology data on these systems and processed manufacturing steps. To achieve acceptable results we describe a way of closing a process loop with the help of metrology data.

MOC_OMP_4404_19

3D Electron beam lithography in for μ - and n-optics*D. Cristea, A. Dinescu, P. Obreja, R. Rebigan; National Institute for R&D in Microtechnologies, IMT-Bucharest (RO)*

The paper presents fabrication techniques based on 3D electron beam lithography (EBL) in mono or multi-layer resists, for fabrication of 3D nanostructures with feature size in the sub-micron range, for micro and nano-optics.

POSTER SESSION | Tuesday, 24 May, 16:10-18:00 | Foyer, 1st Floor, Congress Centre

MOC_OMP_4410_20

3 - meter class space optics made of SiC*M. Bougoin, J. Lavenac; Boostec, Mersen Group (FR).*

Herschel and Gaia are two cornerstone missions of ESA. Both of them embark 3 – meter class optics made of Boostec SiC. This last material turned out to be indispensable for achieving the required mechanical and thermal high stability. The technology is now fully available for future ESA projects such as Spica or Euclid.

MOC_OMP_4412_21

Key manufacturing technology of optical components for EUV experimental lithographer*O.B. Danilov, A.P. Zhevlakov; Institute for Laser Physics Vavilov State Optical Institute (RU).*

Results of research activity on development of basic technology for EUV experimental nanolithographer with planned 10÷30 nm resolution are presented. The illustrations of aspherical mirrors fabricated with atomic-smooth surfaces and high-precision figure are introduced too.

MOC_OMP_4431_22

Rapid Grinding of Metre-Scale Hexagonal Mirror Segments for Ground Based Telescopes*P. Comley, P. Morantz, P. Shore, X. Tonnellier; Cranfield University - Precision Engineering Centre (UK).*

The next generation of ground based telescopes under development require many hundreds of metre scale off-axis mirror segments. These are made in low expansion glass or glass ceramics such as ULE®, Zerodur®, Astroital® or Clearceram®. Their successful fabrication places extreme demands on manufacturing process chain operations: including grinding with high form accuracy, low sub surface damage and roughness, and critically faster processing times. At 42m in diameter the ESO European Extremely Large Telescope (E-ELT) primary mirror is constructed from 984 hexagonal segments, each 1.45m wide and just 50mm thick.

SUB-CONFERENCE:

OPTICAL MANUFACTURING FOR EMERGING PRODUCTS AND PROCESSES

MOC_OMEPP_4301_23

STUDENT PRESENTATION

A novel diffraction type splitter applied on autostereoscopic display*C.-Y. Chen¹, H.-H. Lin², B.-S. Lin³, S.-C. Tseng⁴, Q.-L. Deng⁵; ¹National Yunlin University of Science and Technology, Department of Electronic Engineering (TW); ²Industrial Technology Research Institute of Taiwan (TW); ³National Chiao Tung University, Institute of Imaging and Biomedical Photonics (TW); ⁴National Yunlin University of Science and Technology, Department of Mechanical Engineering (TW); ⁵National Chiao Tung University, Institute of Photonic systems (TW).*

In this research, the symmetric diffractive optical element (SDOE) film was proposed to produce the stereoscopic effect without glasses. In comparison with traditional 3D displays, the average luminance efficiency of simulated results was 77.90%; the crosstalk and chromatic aberration were hardly produced on the display.

MOC_OMEPP_4318_24

Monolithic optical component with segmented free form micro optics*M. Jarczynski, I. Steiner, T. Mitra, L. Aschke; LIMO Lissotschenko Mikrooptik (DE).*

In the optical fabrication, free form optical surfaces are becoming a practical solution for some designs and applications. E. g., in beam splitting applications free form optical surface allow more design freedom and help on innovative solutions. Here, we present a monolithic free form optical component for beam splitting applications.

MOC_OMEPP_4345_25

STUDENT PRESENTATION

Emission spectrum and color of sulfur lamp which is maintained by microwaves*Yu.P. Machekhin, T.I. Frolova, I.A. Shunkova; Kharkiv National University of Radioelectronics, Physical Foundations of Electronic Engineering Department (UA).*

In present report spectral characteristics of electrodeless sulfur plasma lamp which is maintained by microwaves is researched, its color and chromaticity parameters are analyzed. Possibility of effective spectrum radiation of the lamp control by variation of its properties is explored.

MOC_OMEPP_4407_26

STUDENT PRESENTATION

High aspect ratio iridium wire grid polarizer for UV applications*I. Weber¹, T. Käsebier¹, A. Szeghalmi², M. Knez², E.-B. Kley¹, A. Tünnermann^{1,3}; ¹Friedrich-Schiller-University, Institute of Applied Physics (DE); ²Max Planck Institute of Microstructure Physics (DE); ³Fraunhofer Institute for Applied Optics and Precision Engineering (DE).*

We present an iridium wire grid polarizer with a large spectral working range from the infrared down to the ultraviolet spectral region as well as a good long-term stability. A spatial frequency doubling technique based on ultra fast electron beam writing and atomic layer deposition was used to realize a grating period of 100 nm.

NOTES

POSTER SESSION | Tuesday, 24 May, 16:10-18:00 | Foyer, 1st Floor, Congress Centre

MOC_OMEPP_4420_27

Applicative trends for microstructured optics at Carl Zeiss

M. Helgert, R. Steiner, M. Burkhardt, T. Glaser, A. Pesch, O. Sandfuchs, L. Erdmann, A. Deparnay, M. Cumme, A. Gatto; Carl Zeiss Jena GmbH, Technology Centre (DE).

More and more microstructured optical elements are entering scientific optical instruments in a multitude of applications. An overview about trends in four application fields is given by specific examples.

NOTES

SUB-CONFERENCE:

TESTING FOR FABRICATION AND ASSEMBLY

MOC_TFA_4305_28

The Effect of the Surface State on the Strength of Optical Glass and Glassceramics

V.P. Maslov; V.Ye. Lashkarev Institute of Semiconductor Physics, National Academy of Sciences of Ukraine (UA).

The distorted surface layer of optical silicate glass consists of a great number of structural near-surface defects, which are displaced under the action of constant load and thermal fluctuations, reducing the elasticity of the surface layer. The microcreep processes in materials under study can be described by a general equation that is known as the logarithmic microcreep equation. The applicability of this equation for studied optical materials is indicative of the generality of microcreep processes in crystalline and amorphous hard materials.

MOC_TFA_4331_29

Development and Verification of a Wafer Adjustment Process via Wavefront-Analysis

R. Schmitt^{1,2}, R. Krappig¹; ¹Fraunhofer Institute for Production Technology IPT (DE);

²WZL – Laboratory for Machine Tools and Production Engineering (DE).

The excellent use of the economies of scale offered by the wafer-based manufacturing approach is already established within the production of polymer optics. In this work, the extension of the production method to glass optics and especially the metrological verification and validation of the alignment and stacking process steps is introduced and discussed.

MOC_TFA_4344_30

Fast contact-free metrology based on multiwavelength interferometry

G. Berger, J. Petter, R. Nicolaus; Lufos GmbH (DE).

An interferometric, scanning metrology system based on MWLI (multi-wavelength interferometer) technology is introduced. The basic measurement principle of the MWLI system is presented and the capabilities of the unique metrology platform are discussed.

MOC_TFA_4362_31

Non-contact measurement of aspherical and free-form optics with a new confocal tracking profiler

A. Pintó¹, C. Cadevall², R. Artigas², F. Laguarda²; ¹Sensofar-Tech (ES); ²Technical University of Catalonia (UPC) (ES).

We introduce a new non-contact technique for the measurement of aspherical and free-form optics. This technology, called confocal tracking, is based on confocal imaging and consists on tracking the focus on the sample while it is moved along the horizontal axis. It can be considered the optical equivalent of a contact profiler.

MOC_TFA_4411_32

Nanostructural image modelling for testing of EUV projective objective

A.P. Zhevlakov, O.B. Danilov, E.V. Gavrilov; Institute for Laser Physics Vavilov State Optical Institute (RU).

The two mirror Schwarzschild objective with NA=0.36 designed for an experimental EUV lithographer has been studied. Test measurements by computer isophotometry method have shown the capability of this objective to resolve the image features with a size of no more than 50 nm at wavelength of 13.4 nm.

FOREWORD BY THE GENERAL CHAIRS

Welcome to the 1st EOS Conference on Optofluidics!

Optical devices which incorporate liquids as a fundamental part of the structure can be traced as far back as the 18th century where rotating pools of mercury were put forth as a simple technique to create smooth spherical mirrors for use in reflecting telescopes. The evolution of modern microfluidics has enabled the development of a present day equivalent of such devices centered on the marriage of fluidics and optics which has come to be known as Optofluidics. The focus of this conference will be to explore new developments in the field of optofluidics. Potential topics include (but are not limited to) microfluidic lasers, fluid-fluid waveguides, microfluidically tuned optical fiber and inter-ferometers, fluid paper, high resolution in-chip lensless microscopy, optical and photonic tweezers and high sensitivity biomolecular sensor platforms. Research in all application areas are sought, however those of particular interest include reconfigurable photonics, energy application of optofluidics, novel display technologies and biomedical optofluidics.

Topics

- Microfluidic lasers
- Fluid-fluid waveguides
- Microfluidically tuned optical fiber and interferometers
- Fluid paper
- High resolution in-chip lensless microscopy
- Optical and photonic tweezers
- High sensitivity biomolecular sensor platforms
- and specific application areas:
- Reconfigurable photonics
- Energy application of optofluidics
- Novel display technologies
- Biomedical optofluidics

General Chairs



Demetri Psaltis
Ecole Polytechnique Fédérale
de Lausanne (CH)



David Erickson
Cornell University (US)

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KEYNOTE SPEAKERS

Monday, 23 May 2011

11:20-11:50

Room 22



Light-Actuated Microfluidics

Ming C. Wu, Berkeley Sensor and Actuator Center (BSAC) and EECS Department, University of California (US).

Microfluidic circuits are key components for Lab-on-a-Chip devices. In this talk, I will describe a family of light-actuated microfluidic devices for massively parallel control of liquid droplets, cells, or other micro/nano particles. First, I will present our recent research on optoelectronic tweezers (OET). In particular, I will focus on phototransistor OET that is compatible with high conductivity media. Long-term cell culture up to 5 cell generations were achieved. In the second part of the talk, I will describe light-actuated digital microfluidics (LADM). Using light-patterned virtual electrodes to control electrowetting, LADM can address a large number of droplets in parallel using a digital light projector. Compare with conventional electrowetting devices (EWOD or electrowetting on dielectric), LADM is more versatile and can actuate droplets with a wide range of volume (nano to micro liter) simply by change the illuminated spot size. (4432)

Wednesday, 25 May 2011

10:30-11:00

Room 22



Complex Nonlinear Opto-Fluidics: Controlling Flow with Light and Vice-Versa

Mordechai Segev¹, E. Greenfield¹, Y. Lamhot¹, A. Barak¹, A. Szameit¹, J. Nemirovsky¹, M.F. Shih^{1,2}, C. Rotschild¹; ¹Technion – Israel Institute of Technology (IL); ²Physics Department, Taiwan National University (TW).

We demonstrate combined dynamics of light and nano-particles suspended in liquid. Light-force varies the local particle density, modifies the fluid properties, inducing flow patterns in the fluid, causing synergetic nonlinear dynamics of light and fluid. (4395)

INVITED SPEAKERS

Monday, 23 May 2011

14:00-14:30

Room: 22

**Integrated optofluidic interferometric devices**

G. Testa¹, Y. Huang², P.M. Sarro², L. Zen³, Romeo Bernini¹; ¹IREA-CNR (IT); ²ECTM-DIMES, TU Delft (NL); ³DII, Seconda Università di Napoli (IT).

The fabrication and the characterization of a Mach-Zehnder interferometer (MZI) and a ring resonator is reported. The devices are based on optofluidic liquid core antiresonant reflecting optical waveguides (ARROW). The experimental results show that optofluidic devices with good performances can be achieved. (4335)

16:00-16:30

Room: 22

**Multi-color fluorescent DNA analysis in an optofluidic chip**

Markus Pollnau, C. Dongre, H.J.W.M. Hoekstra; Integrated Optical Microsystems Group, MESA+ Institute for Nanotechnology, University of Twente (NL).

Modulation-frequency-encoded fluorescence excitation enables the identification of end-labeled DNA samples of different genetic origin during their electrophoretic separation, opening perspectives for intrinsic size calibration, malign / healthy sample comparison, and exploitation of multiplex ligation-dependent probe amplification. (4306)

Tuesday, 24 May 2011

08:30-09:00

Room: 22

**Optofluidic lenses**

Michael J. Vellekoop, M. Rosenauer; Institute of Sensor and Actuator Systems, Vienna University of Technology (AT).

Fluids can provide adjustable optical properties which cannot be facilitated with solids or only with great fabrication effort. By applying optical fluids in microfluidic devices, the realization of novel miniaturized optical systems becomes possible. In this contribution the design and application of on-chip optofluidic 2D and 3D lenses will be presented and discussed. (4313)

10:30-11:00

Room: 22

**Optofluidic Energy: An Evanescent Photobioreactor**

M.D. Ooms¹, D. Erickson², David Sinton¹; ¹University of Victoria, Mechanical Engineering Department (CA); ²Cornell University, Sibley School of Mechanical and Aerospace Engineering (US).

We present a novel approach to biofuel production applying an optofluidic approach to cultivating and exciting photosynthetic bacteria. This approach utilizes evanescent excitation and has the potential to greatly increase energy density over current technologies. (4384)

11:00-11:30

Room: 22

**Integration of plasmonic trapping in microfluidics for sensing applications**

Olivier J.F. Martin; Nanophotonics & Metrology Laboratory, Swiss Federal Institute of Technology Lausanne (EPFL) (CH).

Optical forces created by the strong field gradients generated by plasmonic nanostructures can be used to trap objects as small as 10nm. The integration of this plasmonic trapping into microfluidics provides novel functionalities for lab-on-a-chip applications. (4380)

14:00-14:30

Room: 22

**Manipulating liquids in 2D and 3D by pyro-EHD (Electro-Hydro-Dynamic) effect: a new platform in Nanofluidics and Optofluidics**

Pietro Ferraro, S. Grilli, S. Coppola, F. Merola, L. Miccio, M. Paturzo, V. Vespini; CNR - Istituto Nazionale di Ottica, Unit of Napoli (IT).

A new opto-nanofluidic approach named Pyro-EHD is presented for streaming liquid nano-pico-droplets through pyroelectric effect activated by thermal stimulus. Manipulation in 2D and 3D of nano-drops and liquid patterning with attoL drops is demonstrated. Further functionalities include self-assembly of liquid microlens array and liquid inkjet printing. (4336)

14:30-15:00

Room: 22

**Opto-Hydrodynamics: pushing, pulling, stretching and pinching fluids by light**

Jean-Pierre Delville; LOMA, Université de Bordeaux, CNRS UMR 5798 (FR).

Opto-hydrodynamics is the discipline which studies the dynamics of fluids under light forcing. To illustrate its large potential, we present here two opposite manifestations of opto-hydrodynamics, flow and jets driven by scattering forces in turbid liquids and jet breaking induced by thermocapillary stresses in light absorbing fluids. (4298)

INVITED SPEAKERS

Wednesday, 25 May 2011

08:30-09:00

Room: 22

**Ultra-compact optofluidic components from rolled-up nanomembranes**

Oliver G. Schmidt; *Institute for Integrative Nanosciences, Leibniz Institute for Solid State and Materials Research Dresden – IFW-Dresden (DE)*.

Nanomembranes are thin, flexible and can be shaped into almost arbitrary geometries. If large differential stresses are introduced into nanomembranes they roll up into micro-/nanotubes once they are released from their host substrate. Such tubes can be made out of almost any material and are fully compatible with standard lithography and processing techniques. As such, they uniquely incorporate diverse active and passive functionalities into single ultracompact devices on a single chip. We create SiO_x based tubes and use them both as fluidic channels as well as for vertical ring resonators.

09:00-09:30

Room: 22

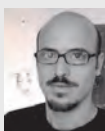
**Selectively liquid-filled planar photonic crystal structures**

Christian Karnutsch¹, *B.J. Eggleton*², *Th.F Krauss*³, *N.A. Mortensen*⁴; ¹*University of Applied Sciences Karlsruhe, Department of Electrical Engineering and Information Technology (DE)*; ²*Institute of Photonics and Optical Science (IPOS) and Centre for Ultrahigh-bandwidth Devices for Optical Systems (CUDOS), School of Physics, University of Sydney (AU)*; ³*School of Physics and Astronomy, University of St. Andrews (UK)*; ⁴*Department of Photonics Engineering, Technical University of Denmark, DTU Fotonik (DK)*.

We give an overview of work on selectively liquid-infiltrated photonic crystal (PhC) components. We present techniques for selective infiltration of PhC air holes, followed by a detailed discussion of optofluidic microcavities and their capabilities in the context of biomedical sensing applications. (4315)

11:00-11:30

Room: 22

**Optically guiding and derailing microfluidic drops on rails**

Charles N. Baroud¹, *C. McDougall*², *E. Fradet*¹, *D. McGloin*²; ¹*LadHyX and Department of Mechanics, Ecole Polytechnique, CNRS (FR)*; ²*Electronic Engineering and Physics Division, University of Dundee (UK)*.

We present a combined mechanical and optical approach to position microfluidic droplets in a two-dimensional area, e.g. for matrices of micro-reactors. The mechanical forcing relies on etching grooves on the channel roof; a mobile laser then actively selects which groove is followed or which drops are liberated from their traps. (4399)

14:00-14:30

Room: 22

**When Optofluidics meets Plasmonics**

Romain Quidant^{1,2}; ¹*ICFO-Institut de Ciències Fòniques, Mediterranean Technology Park (ES)*; ²*ICREA-Institució Catalana de Recerca i Estudis Avançats (ES)*.

In this talk, we describe our recent advances in the engineering of both the optical and thermal properties of plasmonic nanosystems and discuss their respective applications to molecular sensing, nano-optical trapping and fluid dynamics. (4330)

16:00-16:30

Room: 22

**Optofluidic lab-on-a-chip systems with integrated lasers**

Timo Mappes¹, *C. Vannahme*^{1,2}, *T. Grossmann*^{1,3}, *S. Klinkhammer*^{1,2}, *M. Hauser*³, *T. Wienhold*¹, *M. Brækner Christiansen*⁴, *A. Kristensen*⁴, *H. Kalt*³, *U. Lemmer*²; ¹*Karlsruhe Institute of Technology (KIT), Institute for Microstructure Technology (DE)*; ²*Karlsruhe Institute of Technology (KIT), Light Technology Institute (DE)*; ³*Karlsruhe Institute of Technology (KIT), Institute for Applied Physics (DE)*; ⁴*Technical University of Denmark, DTU Nanotech – Department of Micro and Nanotechnology (DK)*.

We present three different parallel processes for the integration of on-chip lasers with optical interconnects. Polymer sheets were structured with multidimensional thermal nanoimprint to enable embedding of first order distributed feedback (DFB) lasers with solid state or liquid core slab waveguides. In a third approach lithography, isotropic etching and thermal reflow was applied to create on-chip low-threshold lasers consisting out of whispering gallery resonators in dye doped PMMA. (4341)

Monday, 23 May		Room
09:30-11:00	Official Congress Opening	1, Congress Centre
09:30	Words of Welcome by <i>Norbert Bargmann</i> , Deputy CEO of Messe München International (DE)	
09:35	Welcoming by <i>Georg Schütte</i> , State Secretary, Federal Ministry of Education and Research (BMBF) (DE)	
09:45	Welcoming by <i>Peter Loosen</i> , President of the Steering Committee, World of PHOTONICS Congress, Fraunhofer Institute for Laser Technology (DE)	
10:15	Opening Plenary Talk Solid-state lasers: Advances and prospects by <i>G. Huber</i> , Institute of Laser-Physics, Hamburg University (DE)	
11:15-11:20	EOSOF 2011 - Conference Opening by the General Chairs <i>Demetri Psaltis</i> , Ecole Polytechnique Fédérale de Lausanne (CH) <i>David Erickson</i> , Cornell University (US)	22, 2nd floor, Congress Centre
11:20-12:20	Session: Optofluidic Manipulation of Cells and Molecules Keynote Talk Light-Actuated Microfluidics <i>Ming C. Wu</i> , Berkeley Sensor and Actuator Center (BSAC) and EECS Department, University of California (US)	
12:20-14:00	Lunch break	
14:00-15:30	Session: Optofluidic and Photonic Elements Invited Talk Integrated optofluidic interferometric devices <i>Romeo Bernini</i> , IREA-CNR (IT)	22, 2nd floor, Congress Centre
15:30-16:00	Coffee break	
16:00-17:30	Session: Novel Optofluidic Applications Invited Talk Multi-color fluorescent DNA analysis in an optofluidic chip <i>Markus Pollnau</i> , Integrated Optical Microsystems Group, MESA+ Institute for Nanotechnology, University of Twente (NL)	22, 2nd floor, Congress Centre
18:00	Get together trade fair and congress	1, Congress Centre
Tuesday, 24 May		Room
08:30-10:00	Session: Imaging, Integration and Fabrication Strategies Invited Talk Optofluidic lenses <i>Michael J. Vellekoop</i> , Institute of Sensor and Actuator Systems, Vienna University of Technology (AT)	22, 2nd floor, Congress Centre
10:00-10:30	Coffee break	
10:30-12:15	Session: Optofluidics Platforms for Biosensing and Energy Applications Invited Talks Optofluidic Energy: An Evanescent Photobioreactor <i>David Sinton</i> , University of Victoria, Mechanical Engineering Department (CA) Integration of plasmonic trapping in microfluidics for sensing applications <i>Olivier J.F. Martin</i> , Nanophotonics & Metrology Laboratory, Swiss Federal Institute of Technology Lausanne (EPFL) (CH)	22, 2nd floor, Congress Centre
12:15-14:00	Lunch break	

Tuesday, 24 May (continued)		Room
14:00-15:30	<p>Session: Optofluidic Flow and Novel Biosensors</p> <p>Invited Talks Manipulating liquids in 2D and 3D by pyro-EHD (Electro-Hydro-Dynamic) effect: a new platform in Nanofluidics and Optofluidics <i>Pietro Ferrara</i>, CNR - Istituto Nazionale di Ottica, Unit of Napoli (IT)</p> <p>Opto-Hydrodynamics: pushing, pulling, stretching and pinching fluids by light <i>Jean-Pierre Delville</i>, LOMA, Université de Bordeaux, CNRS UMR 5798 (FR)</p>	22, 2nd floor, Congress Centre
15:30-16:00	Coffee break	
16:00-18:00	Poster Session	Foyer, 1st floor Congress Centre
17:45	Happy Hour	tba
Wednesday, 25 May		Room
08:30-10:00	<p>Session: Novel Optofluidic Systems</p> <p>Invited Talks Ultra-compact optofluidic components from rolled-up nanomembranes <i>Oliver G. Schmidt</i>, Institute for Integrative Nanosciences, Leibniz Institute for Solid State and Materials Research Dresden – IFW-Dresden (DE)</p> <p>Selectively liquid-filled planar photonic crystal structures <i>Christian Karnutsch</i>, University of Applied Sciences Karlsruhe, Department of Electrical Engineering and Information Technology (DE)</p>	22, 2nd floor Congress Centre
10:00-10:30	Coffee break	
10:30-12:15	<p>Session: Optical Manipulation of Flows</p> <p>Keynote Talk Complex Nonlinear Opto-Fluidics: Controlling Flow with Light and Vice-Versa <i>Mordechai Segev</i>, Technion – Israel Institute of Technology (IL)</p> <p>Invited Talk Optically guiding and derailing microfluidic drops on rails <i>Charles N. Baroud</i>, LadHyX and Department of Mechanics, Ecole Polytechnique, CNRS (FR)</p>	22, 2nd floor Congress Centre
12:15-14:00	Lunch break	
14:00-15:30	<p>Session: Optical and Electrical Fields for Particle Manipulation</p> <p>Invited Talk When Optofluidics meets Plasmonics <i>Romain Quidant</i>, ICFO-Institut de Ciències Fotoniques, Mediterranean Technology Park (ES) & ICREA-Institut Catalana de Recerca i Estudis Avancats (ES)</p>	22, 2nd floor Congress Centre
15:30-16:00	Coffee break	
16:00-18:00	<p>Session: Optofluidic Lasers and Spectroscopy</p> <p>Invited Talk Optofluidic lab-on-a-chip systems with integrated lasers <i>Timo Mappes</i>, Karlsruhe Institute of Technology (KIT), Institute for Microstructure Technology (DE)</p>	22, 2nd floor Congress Centre
18:00	End of EOSOF 2011	

Room 22, 2nd floor, Congress Centre

11:15

Conference Opening by the General Chairs

Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (CH)
David Erickson, Cornell University (US)

11:20-12:20

OPTOFLUIDIC MANIPULATION OF CELLS AND MOLECULES

Chairs: Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (CH)
David Erickson, Cornell University (US)

11:20

Keynote Talk

Light-Actuated Microfluidics

M.C. Wu; Berkeley Sensor and Actuator Center (BSAC) and EECS Department, University of California (US).

Microfluidic circuits are key components for Lab-on-a-Chip devices. In this talk, I will describe a family of light-actuated microfluidic devices for massively parallel control of liquid droplets, cells, or other micro/nano particles. First, I will present our recent research on optoelectronic tweezers (OET). In particular, I will focus on phototransistor OET that is compatible with high conductivity media. Long-term cell culture up to 5 cell generations were achieved. In the second part of the talk, I will describe light-actuated digital microfluidics (LADM). Using light-patterned virtual electrodes to control electrowetting, LADM can address a large number of droplets in parallel using a digital light projector. Compare with conventional electrowetting devices (EWOD or electrowetting on dielectric), LADM is more versatile and can actuate droplets with a wide range of volume (nano to micro liter) simply by change the illuminated spot size. (4432)

11:50

Laguerre-Gaussian photonic quantum ring hole tweezers

O.D. Kwon^{1,2}, T.H. Kim¹, S.E. Lee²; ¹Department of Electric and Electronics and Electrical Engineering, Pohang University of Science & Technology (KR); ²Department of Environmental Science and Engineering, Pohang University of Science & Technology (KR).

We demonstrate a new, simple, effective cell sorting method for massive micro-manipulation of biological cells or small particles in microfluidic channel placed directly on natural Laguerre-Gaussian photonic quantum ring (PQR) hole laser chips. (4332)

12:05

STUDENT PRESENTATION

Advancements in photonic crystal resonators for optical trapping

X. Serey¹, D. Erickson²; ¹School of Applied and Engineering Physics, Cornell University (US); ²Sibley School of Mechanical and Aerospace Engineering, Cornell University (US).

The application of integrated photonics to optical tweezing has led to the development of a series of new nanomanipulation techniques that could eventually be applied to single molecule analysis. In this paper we investigate the effect of the particle on the electromagnetic resonance and the effect of the electromagnetic field on the fluid flow. (4374)

12:20-14:00 Lunch break

14:00-15:30

OPTOFLUIDIC AND PHOTONIC ELEMENTS

Chairs: Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (CH)
David Erickson, Cornell University (US)

14:00

Invited Talk

Integrated optofluidic interferometric devices

G. Testa¹, Y. Huang², P.M. Sarro², L. Zeni³, R. Bernini¹; ¹IREA-CNR (IT); ²ECTM-DIMES, TU Delft (NL); ³DII, Seconda Università di Napoli (IT).

The fabrication and the characterization of a Mach-Zehnder interferometer (MZI) and a ring resonator is reported. The devices are based on optofluidic liquid core antiresonant reflecting optical waveguides (ARROW). The experimental results show that optofluidic devices with good performances can be achieved. (4335)

NOTES

Room 22, 2nd floor, Congress Centre

14:30

Surface Optofluidics Enabled Modulators

A.E. Vasdekis¹, J.G. Cuennet¹, L. De Sio², D. Psaltis¹; ¹Optics Laboratory, School of Engineering, Ecole Polytechnique Fédérale de Lausanne (EPFL) (CH); ²LICRYL, National Institute for the Physics of Matter (INFM-CNR), Center of Excellence CE-MIF.CAL and Department of Physics University of Calabria (IT).

Surfaces and interfaces have attracted substantial attention in many scientific fields. Within this presentation, we will discuss surface optofluidics for light modulation, realised by replacing common microfluidic buffers with liquid crystals. (4367)

14:45

STUDENT PRESENTATION

Advancements in Microfluidically Reconfigurable Photonics

E.E. Jung, A.J. Chung, D. Erickson; Cornell University, Sibley School of Mechanical and Aerospace Engineering (US).

In this paper we describe two major advancements in the area of microfluidically reconfigurable photonics: the demonstration of a highly efficient fiber-in, fiber-out microfluidic switch and the use of fluid recirculation to enable indefinitely long operation without the need for fluid replenishment. (4292)

15:00

Liquid-Gas Microfluidics as a Microstructuring Tool for Optics

A.E.D. Allouch^{1,3}, P. Joseph^{1,3}, A. Monmayrant^{1,3}, O. Gauthier-Lafaye^{1,3}, P. Arguel^{1,3}, F. Lozes^{1,3}, S. Geoffroy^{2,3}, A.-M. Gué^{1,3}; ¹CNRS; LAAS (FR); ²ICA - Institut Clément Ader (FR); ³Université de Toulouse, UPS, INSA, INP, ISAE ; UT1, UTM, LAAS (FR).

We use liquid-gas microfluidics as a low cost, tunable microstructuring tool, with envisioned applications to optics. We obtain stable auto-organized networks of bubbles, with micrometric pitch. We use surface tension to engineer controlled geometrical defects relevant for photonics, within these microfluidic crystals. (4358)

15:15

Magnetofluidic microstructured optical fibre Bragg gratings

A. Candiani¹, W. Margulis², C. Sterner², M. Konstantaki¹, S. Pissadakis¹; ¹Foundation for Research and Technology-Hellas, Institute of Electronic Structure and Laser (GR); ²Department of Fiber Photonics, Acreo AB (SE).

The development of magnetofluidic actuators and modulators utilising microstructured optical fibre Bragg gratings infiltrated by ferrofluids is presented. (4401)

15:30-16:00 Coffee break

16:00-17:30

NOVEL OPTOFLUIDIC APPLICATIONS

*Chairs: Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (CH)
David Erickson, Cornell University (US)*

16:00

Invited Talk

Multi-color fluorescent DNA analysis in an optofluidic chip

M. Pollnau, C. Dongre, H.J.W.M. Hoekstra; Integrated Optical Microsystems Group, MESA+ Institute for Nanotechnology, University of Twente (NL).

Modulation-frequency-encoded fluorescence excitation enables the identification of end-labeled DNA samples of different genetic origin during their electrophoretic separation, opening perspectives for intrinsic size calibration, malign / healthy sample comparison, and exploitation of multiplex ligation-dependent probe amplification. (4306)

16:30

STUDENT PRESENTATION

Anti-counterfeiting pattern by controlling the magnetic dipole interaction of self-assembled superparamagnetic nanoparticles

H. Kim, H.J. Bae, J.H. Byun, S.-E. Choi, L.N. Kim, S. Kwon; School of Electrical Engineering and Computer Science, Seoul National University (KR).

We demonstrate a novel anti-forgery protection pattern by using controlled self-assembly of superparamagnetic nanoparticles and optofluidic maskless lithography. Unique code of a structure can be given through the control of magnetic dipole interaction of superparamagnetic nanoparticles and geometry. (4375)

NOTES

Room 22, 2nd floor, Congress Centre

16:45 STUDENT PRESENTATION
Magnetic structural color patterning: Magnetochromatic microspheres on patterned magnets
Ju. Kim, Y. Song, S. Kwon; Seoul National University (KR).
We demonstrate a simple method of structural color patterning using magneto-chromatic microspheres - magneto-responsive color-changing microspheres - and a patterned magnet with arbitrary-patterned remanent magnetic field directions. (4405)

17:00 STUDENT PRESENTATION
Optical and fluidic applications of wavelength multiplexed plasmonic nanoparticles as localized heat sources
J.-W. Choi^{1,2}, R. Grange^{1,3}, I.N. Papadopoulos¹, D. Psaltis¹; ¹Ecole Polytechnique Fédérale de Lausanne (EPFL), Optics Laboratory (CH); ²California Institute of Technology, Dept. of Electrical Engineering (US); ³Friedrich Schiller Universität Jena, Inst. of Applied Physics, Multiphoton Lab (DE).
Plasmonic nanoparticles efficiently convert light energy to thermal energy at their resonance. This effect is utilized to demonstrate localized heating within a microfluidic channel coated by these nanoparticles. Demonstrations are shown with gold and silver nanoparticles and possibilities of multiplexing are discussed. (4393)

17:15 STUDENT PRESENTATION
Three dimensional actuation of microstructures using optofluidic confinement of self-assembled superparamagnetic nanoparticles in polymer
Ji. Kim, S.E. Chung, S. Kwon; Seoul National University, Electrical engineering (KR).
We present a new magnetic nanocomposite material system and in-situ optofluidic fabrication method for miniaturized microactuators. The key idea is the repeated optofluidic confinements of self-assembled superparamagnetic nanoparticles in polymer, which enables to program magnetic anisotropy in the microstructure. (4409)

18:00 **GET TOGETHER TRADE FAIR & CONGRESS** 1, Congress Centre
Open to all attendees of the World of Photonics Congress 2011 and all exhibitors of the LASER World of PHOTONICS.

NOTES

Room 22, 2nd floor, Congress Centre

08:30-10:00

IMAGING, INTEGRATION AND FABRICATION STRATEGIES

*Chairs: Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (CH)
David Erickson, Cornell University (US)*

NOTES

08:30

Invited Talk

Optofluidic lenses

M.J. Vellekoop, M. Rosenauer; Institute of Sensor and Actuator Systems, Vienna University of Technology (AT).

Fluids can provide adjustable optical properties which cannot be facilitated with solids or only with great fabrication effort. By applying optical fluids in microfluidic devices, the realization of novel miniaturized optical systems becomes possible. In this contribution the design and application of on-chip optofluidic 2D and 3D lenses will be presented and discussed. (4313)

09:00

STUDENT PRESENTATION

Optoelectronic microfluidic backplane for modular optofluidic system design

M. Brammer^{1,2}, D.G. Rabus^{2,3}, T. Mappes¹; ¹Karlsruhe Institute of Technology (KIT), Institute for Microstructure Technology (DE); ²Buerkert Technology Center at KIT (DE); ³University of California, Baskin School of Engineering (US).

Optoelectronic microfluidic backplane modules with integrated optical switches, microvalves, and each with an interface to connect an optofluidic device have been fabricated in polymers. This approach allows the flexible interconnection, supply, and control of an arbitrary number of different optofluidic devices in three dimensions. (4280)

09:15

High contrast optical microscopy in microfluidics devices

O. Théodoly¹, M. Métivier², N. Médard², M.-P. Valignat¹; ¹Université de la Méditerranée, INSERM U600, CNRS UMR6212 (FR); ²Nano-lane (FR).

We present a new sensitive label-free method to investigate solid/liquid interfaces. The method couples optical microscopy to antireflective substrates in microfluidics devices. It allows to visualize and measure simultaneously thin films of nanometric thickness. The relevance of the approach is demonstrated in different fields ranging from physicochemical surface science to live science. (4368)

09:30

Nanoporous liquid core waveguide for turbid analytes

M. Brøkner Christiansen¹, N. Gopalakrishnan¹, K.S. Sagar², A. Berthold¹, S. Ndoni¹, A. Kristensen¹; ¹DTU Nanotech, Department of Micro- and Nanotechnology (DK); ²DTU Chemical Engineering, Department of Chemical and Biochemical Engineering Technical University of Denmark (DK).

Nanoporous liquid core waveguides are fabricated by UV hydrophilizing the desired pattern in a polymer with a network of 14 nm diameter pores. As an analyte fills the hydrophilic pores the index of refraction is raised. Due to the inherent filtering effect of the porous material, we find it ideal for optical analysis of turbid fluids. (4316)

09:45

STUDENT PRESENTATION

Adaptive optofluidic lenses fabricated by femtosecond lasers

N. Bellini¹, K. C. Vishnubhatla², R. Osellame¹; ¹IFN-CNR and Dipartimento di Fisica, Politecnico di Milano (IT); ²Center for Nano Science and Technology of IIT@POLIMI (IT).

We present adaptive cylindrical lenses achieved by filling microfluidic channels with suitable refractive index liquids. The microchannels are fabricated on a fused silica glass substrate by femtosecond laser micromachining followed by chemical etching. (4287)

10:00-10:30 Coffee break

Room 22, 2nd floor, Congress Centre

10:30-12:15

OPTOFLUIDICS PLATFORMS FOR BIOSENSING AND ENERGY APPLICATIONS

*Chairs: Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (CH)
David Erickson, Cornell University (US)*

NOTES

10:30

Invited Talk

Optofluidic Energy: An Evanescent Photobioreactor

M.D. Ooms¹, D. Erickson², D. Sinton¹; ¹University of Victoria, Mechanical Engineering Department (CA); ²Cornell University, Sibley School of Mechanical and Aerospace Engineering (US).

We present a novel approach to biofuel production applying an optofluidic approach to cultivating and exciting photosynthetic bacteria. This approach utilizes evanescent excitation and has the potential to greatly increase energy density over current technologies. (4384)

11:00

Invited Talk

Integration of plasmonic trapping in microfluidics for sensing applications

O.J.F. Martin; Nanophotonics & Metrology Laboratory, Swiss Federal Institute of Technology Lausanne (EPFL) (CH).

Optical forces created by the strong field gradients generated by plasmonic nanostructures can be used to trap objects as small as 10nm. The integration of this plasmonic trapping into microfluidics provides novel functionalities for lab-on-a-chip applications. (4380)

11:30

STUDENT PRESENTATION

An integrated glass microchip for algae identification

A. Schaap¹, Y. Bellouard¹, T. Rohrlack²; ¹Eindhoven University of Technology, Mechanical Engineering (NL); ²Norwegian Institute for Water Research (NO).

We present a monolithic glass chip with an integrated microchannel and waveguides for the real-time identification of algae, and demonstrate the device's ability to optically distinguish the algae species *cyanotheca* from four other algae species using optical sensing. (4307)

11:45

STUDENT PRESENTATION

Lab-in-a-tube: an optofluidic sensor for the detection of individual animal cells

E.J. Smith, S. Schulze, S. Kiravittaya, Y.F. Mei, S. Sanchez, O.G. Schmidt; IFW Dresden, Institute for Integrative Nanosciences (DE).

We have made the first steps towards the realization of an integrative lab-in-a-tube. We put forward a method for capturing individual mouse cells within optofluidic microtube sensors. The flexible split-wall microtube resonator sensors respond to the cells through the enhancement of whispering gallery modes under photoluminescence. (4271)

12:00

Sensitive bio-molecular and chemical micro-fluidic chip platforms with integrated micro-optical components for NUV and VIS spectral detection

L. Frese, S. Neumeyer, T.E. Hansen-Hagge, R. Bleul, K.S. Drese; Institut für Mikrotechnik Mainz GmbH (DE).

The feasibility of sample sensing elements and fluid handling on a lab-on-a-chip system in NUV-VIS spectral range for liquid analysis with integrated optical components has been demonstrated. Fluorescence and absorbance measurements can be performed with different aqueous analytes. Miniaturized devices for in situ process control of fast chemical reactions as well as for quantitative real-time PCR have been realized based on this concept. The advantages of this approach towards a novel system suitable for bio-molecular and chemical in situ measurements have been demonstrated using described optical layouts for in-situ reaction controlling. (4284)

12:15-14:00 Lunch break

Room 22, 2nd floor, Congress Centre

14:00-15:30

OPTOFLUIDIC FLOW AND NOVEL BIOSENSORS

*Chairs: Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (CH)
David Erickson, Cornell University (US)*

14:00

Invited Talk

Manipulating liquids in 2D and 3D by pyro-EHD (Electro-Hydro-Dynamic) effect: a new platform in Nanofluidics and Optofluidics

P. Ferraro, S. Grilli, S. Coppola, F. Merola, L. Miccio, M. Paturzo, V. Vespini; CNR - Istituto Nazionale di Ottica, Unit of Napoli (IT).

A new opto-nanofluidic approach named Pyro-EHD is presented for streaming liquid nano-pico-droplets through pyroelectric effect activated by thermal stimulus. Manipulation in 2D and 3D of nano-drops and liquid patterning with attol drops is demonstrated. Further functionalities include self-assembly of liquid microlens array and liquid inkjet printing. (4336)

14:30

Invited Talk

Opto-Hydrodynamics: pushing, pulling, stretching and pinching fluids by light

J.P. Delville; LOMA, Université de Bordeaux, CNRS UMR 5798 (FR).

Opto-hydrodynamics is the discipline which studies the dynamics of fluids under light forcing. To illustrate its large potential, we present here two opposite manifestations of opto-hydrodynamics, flow and jets driven by scattering forces in turbid liquids and jet breaking induced by thermocapillary stresses in light absorbing fluids. (4298)

15:00

Integrative SiO/SiO₂ microtubes with high-Q optical resonant modes for on-chip sensing applications

L.B. Ma¹, V.A. Bolanos¹, Y.F. Mei², S. Kiravittaya¹, O.G. Schmidt¹; ¹Institute for Integrative Nanosciences, IFW Dresden (DE); ²Fudan University, Department of Materials Science (CN).

Fully integrative microtube resonators with high quality factors have been made from rolled-up SiO/SiO₂ nanomembranes. Highly sensitive detection of water molecule adsorption/desorption on the tube surfaces as well as gas condensation/release is demonstrated by accurate monitoring of resonant modes shift. (4334)

15:15

STUDENT PRESENTATION

Microtube Resonator with Three-Dimensional Light Confinement as a liquid Sensor

V.A. Bolanos¹, L. Ma¹, Y.F. Mei², S. Kiravittaya¹, O.G. Schmidt¹; ¹Institute for Integrative Nanosciences, IFW Dresden (DE); ²Fudan University, Department of Materials Science (CN).

We have investigated three-dimensionally (3D) confined optical resonances in dielectric rolled-up microtube resonators. The inner core was filled with salt solution and a sensitivity of 100 nm/RIU was achieved. The feasibility to use such resonators as ultra-compact sensors opens new horizons for lab-on-a-chip applications. (4337)

15:30-16:00 Coffee break

16:00-18:00

POSTER SESSION

For the Poster Presentations please see pages 47-50

Foyer, 1st floor,
Congress Centre

17:45

HAPPY HOUR

Location tba

NOTES

Room 22, 2nd floor, Congress Centre

08:30-10:00

NOVEL OPTOFLUIDIC SYSTEMS

*Chairs: Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (CH)
David Erickson, Cornell University (US)*

NOTES

08:30

Invited Talk

Ultra-compact optofluidic components from rolled-up nanomembranes

O.G. Schmidt; Institute for Integrative Nanosciences, Leibniz Institute for Solid State and Materials Research Dresden – IFW-Dresden (DE).

Nanomembranes are thin, flexible and can be shaped into almost arbitrary geometries. If large differential stresses are introduced into nanomembranes they roll up into micro-/nanotubes once they are released from their host substrate. Such tubes can be made out of almost any material and are fully compatible with standard lithography and processing techniques. As such, they uniquely incorporate diverse active and passive functionalities into single ultracompact devices on a single chip. We create SiO_x based tubes and use them both as fluidic channels as well as for vertical ring resonators. (4314)

09:00

Invited Talk

Selectively liquid-filled planar photonic crystal structures

C. Karnutsch¹, B.J. Eggleton², Th.F Krauss³, N.A. Mortensen⁴; ¹University of Applied Sciences Karlsruhe, Department of Electrical Engineering and Information Technology (DE); ²Institute of Photonics and Optical Science (IPOS) and Centre for Ultra-high-bandwidth Devices for Optical Systems (CUDOS), School of Physics, University of Sydney (AU); ³School of Physics and Astronomy, University of St. Andrews (UK); ⁴Department of Photonics Engineering, Technical University of Denmark, DTU Fotonik (DK).

We give an overview of work on selectively liquid-infiltrated photonic crystal (PhC) components. We present techniques for selective infiltration of PhC air holes, followed by a detailed discussion of optofluidic microcavities and their capabilities in the context of biomedical sensing applications. (4315)

09:30

Optofluidic chip fabricated by femtosecond laser ablation of PMMA

R. Martínez Vázquez, S.M. Eaton, G. Cerullo, R. Ramponi, O. Osellame; Istituto di Fotonica e Nanotecnologie - CNR, Dipartimento di Fisica - Politecnico di Milano (IT).

An integrated optofluidic chip has been fabricated in PMMA substrates by femtosecond laser micromachining. Microchannels and Fresnel lenses have been fabricated enabling integrated fluorescence detection in a microfluidic chip. (4288)

09:45

Chloroform vapor treatment to restore hydrophilic property of hydrophobic microchannels in PMMA formed by femtosecond laser

C. De Marco¹, S.M. Eaton², R. Martínez-Vázquez², S. Rampini³, G. Cerullo³, R. Ramponi³, S. Turri¹, M. Levi¹, R. Osellame²; ¹Giulio Natta Department of Chemistry - Politecnico di Milano (IT); ²Institute for Photonics and Nanotechnologies – CNR (IT); ³Department of Physics - Politecnico di Milano (IT).

A chloroform vapor treatment was applied to femtosecond laser ablated channels in PMMA. The hydrophobic surface of the microchannels from the submicron porosity induced by ablation becomes smoother and more transparent after the treatment, restoring the original hydrophilic wetting behavior of the pristine PMMA surface. (4275)

10:00-10:30 Coffee break

Room 22, 2nd floor, Congress Centre

10:30-12:15

OPTICAL MANIPULATION OF FLOWS

*Chairs: Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (CH)
David Erickson, Cornell University (US)*

10:30

Keynote Talk

Complex Nonlinear Opto-Fluidics: Controlling Flow with Light and Vice-Versa

M. Segev¹, E. Greenfield¹, Y. Lamhot¹, A. Barak¹, A. Szameit¹, J. Nemirovsky¹, M.F. Shih^{1,2}, C. Rotschild¹; ¹Technion – Israel Institute of Technology (IL); ²Physics Department, Taiwan National University (TW).

We demonstrate combined dynamics of light and nano-particles suspended in liquid. Light-force varies the local particle density, modifies the fluid properties, inducing flow patterns in the fluid, causing synergetic nonlinear dynamics of light and fluid. (4395)

11:00

Invited Talk

Optically guiding and derailing microfluidic drops on rails

C.N. Baroud¹, C. McDougall², E. Fradet¹, D. McGloin²; ¹LadHyX and Department of Mechanics, Ecole Polytechnique, CNRS (FR); ²Electronic Engineering and Physics Division, University of Dundee (UK).

We present a combined mechanical and optical approach to position microfluidic droplets in a two-dimensional area, e.g. for matrices of micro-reactors. The mechanical forcing relies on etching grooves on the channel roof; a mobile laser then actively selects which groove is followed or which drops are liberated from their traps. (4399)

11:30

STUDENT PRESENTATION

Laser-induced flows: Interface deformation and jets in turbid media

J. Petit, H. Chraïbi, R. Wunenburger, J.P. Delville; ¹LOMA, universit  Bordeaux 1, CNRS UMR 5798 (FR).

We study interface deformations resulting from flows generated by light scattering in non absorbing turbid liquids. The tuning of the power of the light beam allows us to explore deformations up to interface disruption. Experimental results are retrieved by an analytical model and numerical simulations. (4304)

11:45

Probing local wetting properties of superhydrophobic surfaces by vibrated micrometer-sized droplets

A. Jon s, Y. Karadag, N. Tasaltin, I. Kucukkara, A. Kiraz; Ko  University, Dept. of Physics (TR).

Contact angles of fluorescently-stained aqueous microdroplets on vibrated superhydrophobic surfaces were determined over micron-sized liquid-solid contact areas from the droplet vibrational resonant frequency and spherical radius measured independently with the use of optical whispering-gallery mode spectroscopy. (4312)

12:00

Unresonant interaction of laser beams with microdroplets

M.L. Pascu, I.R. Andrei, A. Smarandache, C. Ticos, V. Nastasa; National Institute for Laser, Plasma and Radiation Physics, Laser Department (RO).

The generation of microdroplets of distilled water in suspended positions containing volumes of liquid samples from 2µl to 10µl (i.e. having diameters between 300µm and 3mm) is reported. The dynamics of the microdroplets produced by the impact with laser beams focused on them is measured and characterized. (4402)

12:15-14:00 Lunch break

NOTES

Room 22, 2nd floor, Congress Centre

14:00-15:30

OPTICAL AND ELECTRICAL FIELDS FOR PARTICLE MANIPULATION

*Chairs: Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (CH)
David Erickson, Cornell University (US)*

NOTES

14:00

Invited Talk

When Optofluidics meets Plasmonics

R. Quidant^{1,2}; ¹ICFO-Institut de Ciències Fotoniques, Mediterranean Technology Park (ES); ²ICREA-Institució Catalana de Recerca i Estudis Avançats (ES).

In this talk, we describe our recent advances in the engineering of both the optical and thermal properties of plasmonic nanosystems and discuss their respective applications to molecular sensing, nano-optical trapping and fluid dynamics. (4330)

14:30

STUDENT PRESENTATION

Dual-beam optical trap based on embedded solid-core waveguides

M.M. van Leest¹, F. Bernal Arango², J. Caro¹; ¹Delft University of Technology, Kavli Institute of Nanoscience (NL); ²present affiliation: FOM Institute AMOLF (NL).

We propose a dual-beam optical trap integrated in a microfluidic channel, using Si₃N₄ waveguides to obtain two counterpropagating beams. Simulations are performed to study the beam shape and find the trapping force characteristics. Stable trapping is found for polystyrene particles (0.2-1.4 μm), with forces up to 13 pN/W. (4354)

14:45

Geometry-induced trapping, levitation and assembly of nanometric objects in a fluid

M. Krishnan, N. Mojarad, V. Sandoghdar; Laboratory of Physical Chemistry, ETH Zurich (CH).

We present a new concept in the directed assembly of nanometric objects in a fluid. Based on the electrostatic charge carried by an object, the technique provides intervention-free trapping and levitation of nano-objects in a fluid. (4385)

15:00

Holographic tweezers for metal nanoparticles: reconfigurable plasmonics

M. Dienerowitz, G. Gibson, R. Bowman, A. Curran, M.J. Padgett; SUPA, University of Glasgow, School of Physics and Astronomy (UK).

We present a holographic tweezers workstation to optically trap, manipulate and characterise metal nanoparticles. In addition to controlling the position of several particles at once we interrogate their plasmon resonance spectroscopically. We also demonstrate a laser based method to generate fixed arrays of nanoparticles. (4277)

15:15

STUDENT PRESENTATION

Optical tweezers generated by home-made polymeric microaxicons

F. Merola¹, S. Coppola¹, V. Vespini¹, S. Grilli¹, P. Ferraro¹, D. Balduzzi², A. Galli², R. Puglisi²; ¹Istituto Nazionale di Ottica (INO-CNR) (IT); ²Istituto Sperimentale Italiano "Lazzaro Spallanzani" (IT).

Home-made polymeric micro-axicons, a sort of conical lenses with great depth of focus, are used for generating Bessel beams employed as optical tweezers. An explanation of both the fabrication technique and the several trapping applications will be given. (4281)

15:30-16:00 Coffee break

Room 22, 2nd floor, Congress Centre

16:00-18:00

OPTOFLUIDIC LASERS AND SPECTROSCOPY

*Chairs: Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (CH)
David Erickson, Cornell University (US)*

NOTES

16:00

Invited Talk

Optofluidic lab-on-a-chip systems with integrated lasers

T. Mappes¹, C. Vannahme^{1,2}, T. Grossmann^{1,3}, S. Klinkhammer^{1,2}, M. Hauser³, T. Wienhold¹, M. Brækner Christiansen⁴, A. Kristensen⁴, H. Kalt³, U. Lemmer²;
¹Karlsruhe Institute of Technology (KIT), Institute for Microstructure Technology (DE);
²Karlsruhe Institute of Technology (KIT), Light Technology Institute (DE);
³Karlsruhe Institute of Technology (KIT), Institute for Applied Physics (DE);
⁴Technical University of Denmark, DTU Nanotech – Department of Micro and Nanotechnology (DK).

We present three different parallel processes for the integration of on-chip lasers with optical interconnects. Polymer sheets were structured with multidimensional thermal nanoimprint to enable embedding of first order distributed feedback (DFB) lasers with solid state or liquid core slab waveguides. In a third approach lithography, isotropic etching and thermal reflow was applied to create on-chip low-threshold lasers consisting out of whispering gallery resonators in dye doped PMMA. (4341)

16:30

STUDENT PRESENTATION

High output pulse energy foil-based optofluidic dye lasers

C. Vannahme^{1,2}, M. Brækner Christiansen³, T. Mappes¹, A. Kristensen³;
¹Karlsruhe Institute of Technology, Institute for Microstructure Technology (DE);
²Karlsruhe Institute of Technology, Light Technology Institute (DE);
³Technical University of Denmark, DTU Nanotech - Department of Micro and Nanotechnology (DK).

We present polymer foils comprising first order distributed feedback optofluidic dye lasers based on Pyromethene 597 dye dissolved in benzyl alcohol. The devices are fabricated by thermal nanoimprint and thermal bonding out of cyclic olefin copolymer on 4" wafer scale. Lasing occurs at 566 nm and 581 nm. Our design allows output powers of > 1 µJ per pump pulse and stable operation for > 25 min at a pulse repetition rate of 10 Hz. (4310)

16:45

Micro-plasmas on polymer fluidic chips for liquid analysis by optical atom emission spectroscopy

T. Klotzbücher, C. Sommer; Institut für Mikrotechnik Mainz GmbH (DE).

Electrolyte cathode atmospheric glow discharge (ELCAD) method for the first time has been applied on micro-fluidic polymer chip for liquid analysis by optical atom emission spectroscopy. Localised micro-plasmas were generated at asymmetric micro-nozzles, the aqueous solution of which acted as cathode for an atmospheric glow-discharge when entering an argon gas flow. The plasma glow was analyzed by optical atom emission spectroscopy. The method was successfully demonstrated on aqueous solutions, containing metal ions of lithium, calcium and sodium, showing a linear functional dependence on concentration down to 10 mM. (4279)

17:00

Optofluidic Random Laser Chipfabricated by Femtosecondlaser Micromachining

K.C. Vishnubhatla¹, N. Bellini², R. Osellame², G. Lanzani^{1,2}, R. Ramponi², T. Virgili²;
¹Center for Nano Science and Technology of IIT@POLIMI (IT);
²Istituto di Fotonica e Nanotecnologie - CNR and Dipartimento di Fisica - Politecnico di Milano (IT).

Femtosecond laser based micromachining technologies have the inherent capability of producing elements in 3D, their ability of rapid prototyping has been exploited to develop a novel Optofluidic Random Laser Chip. The unique properties of a conjugated polymer in solution are exploited in a microfluidic configuration in order to produce an easy-to-integrate photonic device. (4323)

Room 22, 2nd floor, Congress Centre

17:15

Raman tweezers for monitoring of storage lipids in algal cells: determination of the iodine value

O. Samek¹, Z. Pilát¹, J. Ježek¹, A. Jonáš¹, P. Zemánek¹, M. Šerý¹, L. Nedbal², M. Trtílek³, ¹Institute of Scientific Instruments of the AS CR, v.v.i., Academy of Sciences of the Czech Republic (CZ); ²Institute of Systems Biology and Ecology of the AS CR, v.v.i., Academy of Sciences of the Czech Republic (CZ); ³Photon Systems Instruments (CZ).

The significance of our research lies in exploring Raman tweezers for fast, noninvasive detection and characterization of algal cells in a liquid cultivation medium. We demonstrate the capacity of the spatially resolved Raman tweezers to determine the iodine value of lipid storage bodies in living algal cells. (4340)

17:30

STUDENT PRESENTATION

Raman spectroscopy of particles trapped on a waveguide loop

P. Løvhaugen¹, B.S. Ahluwalia¹, A.Z. Subramanian², J.S. Wilkinson², T. Huser^{3,1}, O.G. Hellesø¹; ¹Dept. of Physics and Technology, University of Tromsø (NO); ²Optoelectronics Research Centre, University of Southampton (UK); ³Dept. of Internal Medicine, University of California (US).

A counterpropagating loop waveguide was used to trap and propel microparticles. A gap was introduced at the far side of the loop. The propelled particles were stably trapped at the gap with no need of waveguide power distribution adjustments. Raman spectra were obtained from particles on the waveguide and at the gap. (4333)

17:45

STUDENT PRESENTATION

Polymeric optofluidic cell based on vertically coupled microresonators for label-free biosensing

C. Delezoide², J. Lautre¹, I. Ledoux-Rak², J. Zyss², C.T. Nguyen²; ¹Ecole Normale Supérieure de Cachan, Institut d'Alembert, ²Ecole Normale Supérieure de Cachan, Laboratoire de Photonique Quantique et Moléculaire (FR).

We report a high-performance polymeric optofluidic cell based on vertically coupled microracetrack resonators, made of photoresist SU-8 and CYTOP amorphous fluoropolymers, for label-free biosensing applications. The microresonators immersed in deionized water display a best Q-factor of 34400 at 1584 nm wavelength. (4396)

18:00 **End of the 1st EOS Conference on Optofluidics (EOSOF 2011)**

NOTES

POSTER SESSION | Tuesday, 24 May, 16:00-18:00 | Foyer, 1st Floor, Congress Centre

OF_4276_01

Optofluidics for lab-on-a-chip: from manufacturing to real life applications*R.G. Heideman, A. Leinse, H. Leeuwis, A. Prak; LioniX bv (NL).*

In recent years, the combination of optics with microfluidics -often referred to as optofluidics- has attracted a lot of R&D attention. Despite these efforts, only a very limited amount of applications are commercially available, the majority of them showing a very limited integration level. The unique combination of microfluidics with *integrated* optics gives LioniX an unrivaled experience, which is demonstrated with integration of planar optical waveguides for LIF and label-free detection in microfluidic analysis systems.

NOTES

OF_4285_02

STUDENT PRESENTATION

Towards VCSEL-Based Integrated Microfluidic Sorting Systems*A. Bergmann, A. Kroner, R. Michalzik; Ulm University, Institute of Optoelectronics (DE).*

We present the concept of an ultra-small, potentially low-cost microfluidic sorting unit based on optical traps. The dense vertical-cavity laser arrays are integrated with the microfluidic channels and form an optical lattice. First experimental results and optimization steps are shown.

OF_4297_03

Fabrication and characterization of a tunable liquid lens array by applying pressure*M. Riahi; Laser and plasma research institute, Shahid Beheshti University (IR).*

Array of the hexagonal holes are made on a PMMA sheet. A thin flexible transparent sheet of PDMS is placed on the PMMA holes and these layers are placed on the surface of a thin water reservoir. By applying pressure to the reservoir, the water gets the curve shape in the position of holes because of the flexible PDMS sheet.

OF_4299_04

Microparticle manipulation by switching order of Bessel light beam*V.N. Belyi, S.B. Bushuk, N.S. Kazak, A.N. Rubinov, A.A. Ryzhevich; Institute of Physics of NAS of Belarus (BY).*

A new method for assemblage, filtration, and high precise controlled transportation of microparticles in fluidic medium is proposed and experimentally tested. Switching order of Bessel light beam (BLB) from the zeroth to the first and inversely causes particle displacement from periphery of BLB to its axis under gradient force influence.

OF_4300_05

Method for shaping quasi-hyperbolic light beam*V.N. Belyi, A.A. Ryzhevich, S.V. Solonevich; Institute of Physics of NAS of Belarus (BY).*

The method for shaping new type light field with radial intensity distribution similar to hyperbolic is proposed and tested experimentally. The obtained quasi-hyperbolic beam has narrow (several micrometers) and lengthy (several centimeters) axial intensity maximum. This beam can be used as tweezer for microparticles in fluid.

OF_4309_06

STUDENT PRESENTATION

Photorefractive opto-electric tweezers*M. Esseling, S. Gläsener, C. Denz; Westfälische Wilhelms-Universität Münster, Institute for Applied Physics & Center for Nonlinear Science (CeNoS) (DE).*

We present the manipulation of microparticles in a microfluidic system by light-induced dielectrophoretic forces originating from photorefractive materials. The previously demonstrated concept of 2D structuring is extended to in-situ manipulation in microchannels and to faster materials that show a real-time response.

OF_4311_07

Thiolene click chemistry modified Nanoporous Waveguides*N. Gopalakrishnan¹, A. Berthold¹, K.S. Sagar², M.B. Christiansen¹, S. Ndoni¹, A. Kristensen¹;**¹DTU Nanotech, Technical University of Denmark (DK); ²Danish Polymer Center, Department of Chemical and Biochemical Engineering, Technical University of Denmark (DK).*

We demonstrate waveguiding in nanoporous polymers by inducing an effective refractive index contrast of $\Delta n = 0.17$ with selective water infiltration, which is obtained by nanopore surface modification using UV enhanced thiolene click chemistry. Propagation losses in these are studied and compared with similar waveguides.

POSTER SESSION | Tuesday, 24 May, 16:00-18:00 | Foyer, 1st Floor, Congress Centre

OF_4321_08

Terahertz radiation in ion acoustic waves generated of laser plasma interaction*P. Zobdeh¹, H. Zarey²; ¹Department of Physics, Qom Branch Islamic Azad University (IR); ²Qom Branch Islamic Azad University (IR).*

Electromagnetically induced transparency in plasma can be used to create a pass band for low-frequency electromagnetic wave in over dense plasma. Also it could be transmitted ion acoustic wave even if the ion acoustic frequency is lower than the plasma frequency. In this study, we investigate the behavior of ion density that cause to generation Terahertz.

OF_4371_09

Electrons recoil probability of attosecond waves generation*P. Zobdeh¹, H. Rafiee-miyandashi²; ¹Department of Physics, Qom Branch Islamic Azad University (IR); ²Qom Branch Islamic Azad University (IR).*

A new phenomenon of laser matter interaction is attosecond EM generation that is described recently. It provides a new method that could be used in the fast atomic scales measurement. Electrons are confined by coulomb potential in atom, in normal condition. The electron can tunnel from the atom with the large produced force. It decreases the electron and ion attraction and splits the electron and ion rapidly so electron escapes the ion. In fact, electrical field of the light pushes the wave packet away from the ion firstly, but by reversing the field direction, the force cause to come back the electron. The times of recollision could be synchronized by laser pulse and it can be of attosecond precision. We described frequency domain of EM Attosecond generated in our last work, and in this work, we have investigated the collisional recoil probability of electron with different amplitude for continuum wave function ($a(k)$).

OF_4325_10

STUDENT PRESENTATION

Optofluidic Tunable Polarizer Based on Liquid Crystal for Lab-on-a-chip Applications*R. Ranjini, M. Vadakke Matham, N.-T. Nguyen; Department of Mechanical and Aerospace Engineering, Nanyang Technological University (SG).*

Optofluidics is one of the recent thrust interdisciplinary research areas which made possible to build several lab-on-a-chip devices. Incorporation of liquid crystal as the fluid medium in the optofluidics can provide tunability in optical polarization, which can be used for the fabrication of optofluidic polarization devices.

OF_4329_11

STUDENT PRESENTATION

An Innovative Concept of a Magnetically Driven Liquid Lens*T. Schultheis^{1,2}, L. Spani Molella¹, E. Reithmeier^{1,2}; ¹Leibniz Universität Hannover, Hanover Center for Optical Technologies (DE); ²Leibniz Universität Hannover, Institute of Measurement and Automatic Control (DE).*

The refractive surface shape of liquid lenses can be tuned to change its curvature radius. We introduce an innovative mechanism to adjust the refractive surface shape and present how to vary the focal length by a liquid volume displacement by driving a magnetic sensitive ferrofluidic plug inside a micro channel.

OF_4339_12

Random Laser Emission in Innovative Structured Optofluidic Channel*S. Bhaktha B.N., X. Noblin, P. Sebbah; Laboratoire de Physique de la Matière Condensée, CNRS UMR 6622 and Université de Nice-Sophia Antipolis (FR).*

We have designed an innovative structured PDMS microfluidic channel that we filled with an ethanolic dye solution. We report random laser emission attributed to the inherent randomness in this structure. A systematic study on the origin of random lasing, and its dependency on pump laser parameters is presented.

OF_4346_13

Experimental and theoretical study of geometrization of lensless microscopy*G.S. Melnikov^{1,2}, V.V. Korotaev¹; ¹SPSU "ITMO" (RU); ²Federal State Unitary Enterprise "NPK GOI im. SI Vavilov" (RU).*

The report presents the results of years of experimental and theoretical research to develop techniques for creating computer-generated holograms (CGH), and the relationship of the diffraction responses from regular 2D and 3D structures with their geometric topology. The justification possible correct interpretation of research results generated images (patterns) of obtained data lensless microscopy (tunneling-probe microscopy, diffraction microscopy) presents the results of modeling changes over time in three-dimensional sphere. Solution to the problem of geometrization of space-time and the determination of the internal 3D structure of the samples in the simulation performed in quaternion parametric constructions.

NOTES

POSTER SESSION | Tuesday, 24 May, 16:00-18:00 | Foyer, 1st Floor, Congress Centre

OF_4350_14

STUDENT PRESENTATION

Carbon nanotube photoluminescence studies in controlled microfluidic environment*F. Bergler, F. Schöppler, T. Hertel; University of Würzburg, Institute of Physical and Theoretical Chemistry (DE).*

Individual single-wall carbon nanotubes (SWNTs), fixed in a microfluidic environment exhibit shifts in the first excitonic transition energy as well as changes in photoluminescence (PL) quantum yield that depend on the concentration of the surrounding surfactant in aqueous solution.

NOTES

OF_4351_15

STUDENT PRESENTATION

Light diffusion in colloidal suspensions of nanoparticles

A.V. Alfimov¹, E.M. Aryslanova¹, D.N. Vavulin¹, O.V. Andreeva¹, V.V. Lesnichiy¹, S.A. Chivilikhin¹, I.Yu. Popov², V.V. Gusarov³; ¹Saint-Petersburg State University of Information Technologies, Mechanics and Optics, Photonics and Optical Information Technology Department (RU); ²Saint-Petersburg State University of Information Technologies, Mechanics and Optics, Higher Mathematics Department (RU); ³Saint-Petersburg State Institute of Technology, Physical Chemistry Department (RU).

A method for determining the characteristic size of nanoparticles or other nanoscale inhomogeneities in systems with high concentration is proposed. The method is based on theoretical and experimental study of light diffusion in the considered medium.

OF_4355_16

STUDENT PRESENTATION

Dielectrophoresis for the Manipulation of Polymeric Waveguide Properties: Feasibility for Optofluidic Sensing

A. Kayani¹, A. Chrimes¹, K. Khoshmanesh², K. Kalantar-zadeh¹, A. Mitchell¹; ¹School of Electrical and Computer Engineering, RMIT University (AU); ²Center for Intelligent Systems Research, Deakin University (AU).

Polystyrene and tungsten trioxide nanoparticle suspensions were infiltrated into a microfluidic channel acting as the top cladding of a rib polymeric waveguide. Dielectrophoresis was used to manipulate these particles into forming tightly packed streams of high refractive index media. Under specific dielectrophoretic conditions, the waveguide demonstrates either guiding or scattering of light. This phenomena demonstrates the feasibility of using this platform as an optofluidic sensor for nanoparticles.

OF_4357_17

Study of the impact of different optical tweezers wavelengths on living cells in microfluidic chips

J. Ježek, Z. Pilát, O. Samek, P. Zemánek; Institute of Scientific Instruments of the ASCR, v.v.i., Academy of Sciences of the Czech Republic (CZ).

Microfluidic chips can be used to study the behavior of individual living cells after exposition to optical tweezers of different wavelengths. We combined microfluidics with an advanced fluorescence microspectroscopic methods to determine the maximal photosynthetic quantum yield (Φ) of individual algal cells.

OF_4359_18

Flexible dual-beam geometry for advanced optical micromanipulation experiments

O. Brzobohatý¹, T. Čížmár², K. Dholakia², P. Zemánek¹; ¹Institute of Scientific Instruments of the ASCR, v.v.i., Academy of Sciences of the Czech Republic (CZ); ²SUPA, School of Physics and Astronomy, University of St Andrews (UK).

We present an advanced configuration for optical manipulation of micro- and nanoobjects employing adaptive optical element to control properties of more counterpropagating beams overlapping in a sample chamber.

OF_4364_19

Optical sorting of dielectric microparticles in dynamic interference patterns

P. Ják¹, A.V. Arzola², P. Zemánek¹, M. Šiler¹, K. Volke-Sepúlveda²; ¹Institute of Scientific Instruments of the ASCR, v.v.i., Academy of Sciences of the Czech Republic (CZ); ²Instituto de Física, Universidad Nacional Autónoma de México (MX).

Dielectric particles of different properties (size, shape, refractive index) seek different equilibrium positions in one-dimensional optical lattice and also feel stronger/weaker influence of the optical forces. We utilize this phenomenon to sort heterogeneous suspension of silica spheres by travelling interference fringes of particular thickness.

POSTER SESSION | Tuesday, 24 May, 16:00-18:00 | Foyer, 1st Floor, Congress Centre

OF_4365_20

Preparation of RE ions-doped YSZ microtubes and their optical and luminescent properties

K. Utt, M. Part, T. Tättte, V. Kiisk, S. Lange, L. Sildos; Institute of Physics, University of Tartu (EE).
A novel sol-gel route has been elaborated for preparation yttria-stabilized zirconia (YSZ) microtubes in tetragonal phase. The material was doped with Sm³⁺ or Eu³⁺ ions. Transparent, crack-free and brightly luminescent microtubes were obtained after annealing at temperatures up to 1100°C.

OF_4370_21

STUDENT PRESENTATION

Opto-thermal actuation of λ phase DNA suspended in a polymer based nano topography

C.J. Lüscher, R. Marie, A. Kristensen; DTU Nanotech, Department of Micro- and Nanotechnology, Technical University of Denmark (DK).

Single isolated DNA molecules were immobilised in a nanopit array using entropy trapping. A single molecule could be addressed using optothermal actuation to create a local perturbation of the free energy and introduce a thermophoretic force. The optothermal actuation is based on absorption of near infrared laser beam in dye modified polymer layer.

OF_4378_22

STUDENT PRESENTATION

Optical confinement and alignment of dielectric and metallic nanorod in single polarised scalar and vector Gaussian beam

J. Trojek, P. Zemánek; Institute of Scientific Instruments of the ASCR, v.v.i., Academy of Sciences of the Czech Republic (CZ).

We present a theoretical analysis of behaviour of dielectric and metallic nanorod placed in a single linearly polarised Gaussian beam in both scalar and vector descriptions. Comparison with experimental observations done before reveals that only vector field description can explain the trapping of gold nanorods near its longitudinal plasmon resonance wavelength.

OF_4403_23

Fighting Multiple Drug Resistance of bacteria by treatment with Chlorpromazine modified by exposure to laser radiation

M.L. Pascu¹, V. Nastasa¹, A. Militaru¹, A. Staicu¹, A. Smarandache¹, S. Fanning², L. Amara³;
¹National Institute for Laser, Plasma and Radiation Physics, Laser Department (RO); ²UCD Centre for Food Safety, School of Agriculture, Food Science and Veterinary Medicine, University College Dublin (IE); ³Unit of Mycobacteriology and UPMM, Instituto de Higiene e Medicina Tropical, Universidade Nova de Lisboa (PT).

Chlorpromazine active against bacteria was exposed to two distinct laser beams for varying periods of time. This kind of exposure to laser radiation alters the molecular structure – reflected in the absorption/fluorescence spectra - of it that results in its altered activity against a Staphylococcus aureus ATCC strain.

OF_4406_24

STUDENT PRESENTATION

Optofluidic shutter driven by electrowetting

P. Müller, A. Kloss, H. Zappe; University of Freiburg, Department of Microsystems Engineering (IMTEK) (DE).

We present a novel miniaturized optical shutter based on optofluidic technology. The optical transmission of the chip within a defined aperture area can be changed by displacing a highly absorbent liquid with a transparent one.

OF_4414_25

Optical singularities, relationship between intensity distribution and other characteristics of vector field

I. Mokhun, Yu. Galushko, Ye. Kharitonova, R. Khrobatin, Yu. Viktorovskaya; Chernivtsi University, Department of Correlation optics (UA).

In the paper, we take it into one's head to show how different singularity systems of different parameters of an optical wave are connected and what follows from this connection. The results of computer simulation are presented.

NOTES

POSTER SESSION | Tuesday, 24 May, 16:00-18:00 | Foyer, 1st Floor, Congress Centre

OF_4415_26

Creation of polarization singularities by waves superposition*L. Mokhun, Yu. Galushko, Ye. Kharitonova, R. Khrobatin, Yu. Viktorovskaya; Chernivtsi University, Department of Correlation optics (UA).*

The new approach for experimental modeling of elementary field cells with polarization singularities is proposed. It is shown that such cells may be obtained by the superposition of orthogonally linearly polarized waves with relatively simple phase surfaces and close intensities.

OF_4416_27

Optofluidic devices based on liquid crystals*D.E. Lucchetta, F. Vita, F. Simoni; Università Politecnica delle Marche, Dipartimento di Fisica ed Ingegneria dei Materiali e del Territorio (FIMET), Consorzio Nazionale Interuniversitario per le Scienze Fisiche della Materia (CNISM-MATEC) (IT).*

We report the realization and the characterization of optofluidic devices including a nematic liquid crystal as basic fluid element. The unique uniaxial nature of the liquid crystal molecules connected with their optical, mechanical and electrical anisotropies is exploited for modulating the device optical properties. All-optical switching was demonstrated in a polymeric substrate containing a transmission grating infiltrated with a Methyl Red doped liquid crystal, where the strong nonlinear response was controlled by the application of a static electric field. As second step of the investigation, liquid crystal was used in a microfluidic channel, made in poly (dimethylsiloxane) by soft lithography, crossing an SU-8 holographic grating and the effect of the flow velocity on the liquid crystal orientation was studied. Preliminary results obtained for an optofluidic laser based on this configuration are reported.

OF_4417_28

STUDENT PRESENTATION

Immobilization of concentrated photosynthetic organelles in hydrogel matrix using maskless lithography*H. Kim, S.-E. Choi, S. Kwon; School of Electrical Engineering and Computer Science, Seoul National University (KR).*

Photosynthesis is a key process for the global environment. We show that the planar density of photosynthetic organelles can be increased by following manner: 1) extraction of photosynthetic organelles from nature, 2) concentration, 3) immobilization in hydrogel matrix. Mass transport in condensed matrix is also presented. The work herein may have a significant impact on the design of the artificial photosynthesis reactor.

OF_4423_29

3D laser fabrication for microfluidics*M. Bouriau, P. Marmottant; Laboratoire Interdisciplinaire de Physique, CNRS/Université de Grenoble 1 (FR).*

Laser micro-stereolithography can generate tiny objects with a sub-micrometer resolution. These 3D objects of arbitrary shape are helpful to develop new microfluidic designs. Two examples are presented: a static reduction of a fluidic channel, and a free-standing micro-swimmer.

OF_4425_30

A localized surface plasmon sensor for early cancer detection (SPEDOC)*F. Rohde, R. Porcar; COSINGO, Imagine Optic Spain SL (ES).*

We present the prototype of a biosensor that exploits surface plasmon resonances of gold nanostructures integrated in a microfluidic environment to track HSP70 proteins in the peripheral blood.

OF_4457_31

STUDENT PRESENTATION

Optical simulation of a fluorescence detection system with multispectral sensors*K. Dornbusch, K.-H. Feller; University of Applied Sciences Jena, Department Medical Engineering and Biotechnology, working group instrumental chemical analysis (DE).*

The ultrasensitive detection of fluorescence under micro fluidic conditions where lots of spatial and other restrictions prevent optimal measurement geometry is an important task in process analysis. In this respect it is very important to have as little losses as possible to get a signal with a high SNR and high sensitivity. Therefore it is very helpful to be able to abstain from monochromators and slits in the optical path.

Aim of the presented work is to develop an optimized ultrasensitive multichannel optical measurement system for transmission and fluorescence measurements of liquid media in small channels.

NOTES



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2) PAYMENT BY BANK TRANSFER

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CANCELLATION POLICY:

Requests for cancellation must be made in writing to the EOS Office (address see below). Refunds are subject to a processing fee of 50 €.

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EOS EVENTS IN 2011

**4th EOS Topical Meeting on Optical Microsystems (OμS'11)***Capri, Italy | 26 - 28 September 2011***Topics:**

- Plasmonics, photonic crystals and metamaterials
- Optical microsystems and microsensors
- Optofluidic microsystems and device
- Nonlinear optics devices
- New characterisation methods for materials and devices
- Coherent Imaging and microcopy techniques and methods
- Applications of optical systems

Joint sessions with ETML'11:

- Terahertz
- Photonics for aero-space

Abstract due date:

3 June 2011

www.myeos.org/events/OMS2011 | capri@myeos.org**2nd EOS Topical Meeting on Lasers (ETML'11)***Capri, Italy | 26 - 28 September 2011***Topics:**

- Semiconductor lasers
- Fiber lasers
- Diode-pumped solid-state lasers
- Nonlinear optical devices
- Ultrafast lasers
- Materials for non-linear optics and lasers
- Quantum dot lasers

Joint sessions with OμS'11:

- Terahertz
- Photonics for aero-space

Abstract due date:

3 June 2011

www.myeos.org/events/ETML2011 | capri@myeos.org**1st EOS Topical Meeting on Micro- and Nano-Optoelectronic Systems***Bremen, Germany | 6 - 9 December 2011***Potential topics include:**

- Design, simulation and fabrication of micro- and nano-optical systems
- Integration of micro- and nano-optical systems in micro-electronics
- Novel functionalities
- Optical metrology for and by micro- and nanosystems
- Application of microsystems using micro- and nano-optics including sensors
- Digital holography with an emphasis on microsystems

Abstract due date:

9 September 2011

www.myeos.org/events/bremen2011 | bremen@myeos.org

EOS EVENTS IN 2012

**1st EOS Topical Meeting on Photonics for Sustainable Development - Focus on the Mediterranean (PSDM 2011)***Tunis, Tunisia | 31 March - 3 April 2012***Topics:**

- Biophotonics
- Optics and energy
- Optics and environment
- Optical communications
- Organic photonics
- Optical sensing

Abstract due date:

5 December 2011

www.myeos.org/events/psdm2012 | psdm2012@myeos.org**6th EOS Topical Meeting on Visual and Physiological Optics (EMVPO 2012)***University College Dublin (UCD), Dublin, Ireland | 20 - 22 August 2012*

Topics: This conference will cover many aspects of visual and physiological optics, including clinical studies, basic research, and instrumentation, for example:

- Eye models and intraocular lenses
- Cornea and lens
- Anterior segment imaging
- Aberrations and retina image quality
- Ocular wavefront sensing
- Peripheral wavefront sensing and vision
- Retina optics and photoreceptor function
- Vision and physiological optics
- Retinal imaging and analysis
- Novel instrumentation and techniques
- Numerical image processing
- Multiphoton techniques

Abstract due date:

30 March 2012

www.myeos.org/events/emvpo2012 | emvpo2012@myeos.org

A continuously updated list of EOS organized and co-sponsored events is available at: www.myeos.org/events

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The paper submitted must be an original contribution that is connected to the topics of the EOS event.

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320 € (non-member rate)

Submission deadline

29 July 2011