

September 14 and 15, 2009  
IZS Campus, Stuttgart



# International Conference Stuttgart Nanodays

visions for short and medium-term  
applications

# Foreword

One of the main challenges of this century is to overcome the problem of continuous global warming and fading natural resources. As an attempt to find alternatives to existing solutions, numerous R&D efforts have been made aiming for the development of light-weight structures, novel kinds of energy harvesters, thermally and electrically conductive materials based on carbon nanotubes.

Stuttgart Nanodays 09 is an international scientific conference which brings together leading scientists, key industrial players and politicians together under one umbrella to share ideas on emerging carbon nanotube applications. Along with this renowned scientific community the department of Process Engineering of Functional Materials of the Fraunhofer IPA would like to present you the recent research findings in this area.

At Stuttgart Nanodays 09 we will specifically focus on the issues of actuation, conductivity, transparency and processing of this highly acclaimed material.

I am looking forward to welcoming you in Stuttgart!

Stuttgart, August 2009

Directors



Prof. Dr.-Ing. Prof. e. h. Dr.-Ing. e. h. Dr. h. c. mult.  
Engelbert Westkämper



Prof. Dr.-Ing. Alexander Verl

# About the conference

## Scope

The conference scope covers four focus sessions: carbon nanotube actuators, transparent conductive films, lightweight materials and advanced composites.

### Actuators

Since the original pioneering work in carbon nanotube actuators several years ago, major strides have been made in our understanding of the processes involved in nanotube actuation. Today, the field is quickly filling the gap between demonstration and application. This session will give today's perspective of the challenges faced by commercialization of nanotube-based actuators and where they may play a role within the marketplace.

### Transparent Conductive Films

Transparent conductive oxides (TCOs) such as Indium Tin Oxide (ITO) currently provide the only available approach to flexible organic optoelectronic devices such as polymer photovoltaics, organic light emitting diodes, and transparent transistors for head-up display technologies. TCOs face many challenges including rapidly increasing costs, poor adherence to plastic substrates and significant near-infrared absorption. Recent advances in the transparency and conductivity of heterogeneous carbon nanotube films make them an excellent alternative material for TCOs. This session will present the carbon nanotube qualities that outperform TCOs in the context of synthesis and processing. Approaches for the introduction into existing ITO markets will be examined.

# About the conference

## **Lightweight Materials**

In industries such as aircraft and automotive, breakthrough technologies in high-strength, lightweight materials will result in fuel efficiency, a lower carbon footprint and carbon dioxide emission. A novel new approach to metal matrix materials with higher mechanical, tensile strength and higher thermal conductivity involves using carbon nanotubes incorporated directly into metal structures. This session will address the advances in this field and the potential for realizing meaningful improvements to structural materials properties.

## **Advanced Composites**

Incorporation of carbon nanotubes into composites is not only a matter of material reinforcement. They can also make materials lighter, more ductile, stronger, and more thermally and electrically conductive. Currently there is a broad range of applications, from biomedical, automotive to satellites, under investigation. However, to tap the full potential of carbon nanotube composites, significant advances in the processability and standardization of this unique material are needed. This session will examine some of the broad applications contemplated, and the needs in processing that are faced by the marketplace.

## **Time and Location**

September 14 – Conference

September 14 – Conference dinner at Schloss Solitude, 6 pm

September 15 – Conference

September 15 – Closed Workshop »Future Topics in the Area of CNT« – Participation only upon signing an NDA

Location: Fraunhofer IZS Campus Stuttgart , 9 am – 5 pm

## **Chairmen**

Siegmar Roth (Seoul/Stuttgart)

Ivica Kolaric (Stuttgart)

# Program

Monday, September 14, 2009

From

8:30      **Arrival and coffee**

9:00      Engelbert Westkämper, Fraunhofer IPA, Stuttgart,  
Germany

**Welcome and Introduction**

9:20      **Opening words from the Chairman**

## Actuators session

9:30      Ray Baughman, University of Texas at Dallas, USA

**Superelastic Carbon Nanotube Muscles  
Providing Giant Strokes and Giant Stroke Rates  
from 0 to 1900 K**

10:00      Kenji Kiyohara, National Institute of Advanced  
Industrial Science and Technology, Osaka, Japan

**Fully Plastic Carbon Nanotube Actuators  
Operable in Air by Low Voltage**

10:30      **Coffee break**

11:00      Siegmar Roth, Korea University, School of Electrical  
Engineering, WCU Flexible Nanosystems, Seoul, Korea

**Nanotube Actuators: Facts, Visions, Ways**

11:30      Ivica Kolaric, Fraunhofer IPA, Stuttgart, Germany

**Long-run Behaviour of Carbon Nanotube  
Actuators**

12:00      **Lunch break**

# Program

Monday, September 14, 2009

## Transparent conductive films session

- 13:00 Anvar Zakhidov, University of Texas at Dallas, USA  
**Tandem Organic Solar Cell Architectures with Transparent Carbon Nanotubes**
- 13:30 David Carroll, Wake Forest University, Winston-Salem, USA  
**Nanotube Composites for Modification of Dielectric Properties for Use in Lighting Systems and Other Applications OR Thermoelectric Nanotube Composites**
- 14:00 Coffee break
- 14:30 Carlo Taliani, Institute of Nanostructured Materials, CNR Bologna, Italy  
**Novel Highly Transparent and Conducting Transparent Oxides (TCO) Deposited at Room Temperature on PET, Organic Semiconductors and CNT**
- 15:00 Hye Jin Park, Max Planck Institut für Festkörperforschung, Stuttgart, Germany  
**Transparent Conductive Film Based on Few-Layer Graphene**
- 15:30 Jin-Hong Du, Institute of Metal Research, Chinese Academy of Sciences, Shanghai, China  
**Carbon Nanotube & Graphene/Polymer Composites and Transparent Conductive Films**
- 16:00 **Review and closing words from the Chairman**
- 17:15 Shuttle bus service to Schloss Solitude
- 18:00 Dinner at Schloss Solitude

# Program

Tuesday, September 15, 2009

From

8:30

Arrival and coffee

## Lightweight materials session

9:00

**Opening words from the Chairman**

9:15

Horst Adams, Bayer International SA, Fribourg, Switzerland

**Carbon Nanotube Reinforced Aluminium**

9:45

Carsten Glanz, Fraunhofer IPA, Stuttgart, Germany

**Limitations and Possibilities of Casted Aluminium and Copper CNT Alloys**

10:15

Coffee break

10:45

Henning Zoz, Zoz GmbH, Wenden, Germany

**High Kinetic Processing as a Commercial Manufacturing Technique for Nanostructures in Large Volume Including CNT-reinforced Lightweight Materials (Al+Baytubes®) in Cooperation with Bayer MaterialScience**

11:15

Katsuyoshi Kondoh, Joining and Welding Research Institute Osaka University, Japan

**High-strengthened and Cost-effective Titanium Composites Reinforced with Carbon Nanotubes and In Situ Formed Oxides**

11:45

Mohammad Haque, University of Texas at Dallas, USA

**Fabrication and Properties of Carbon Nanotubes Fibers and Yarns**

12:15

Lunch break

# Program

Tuesday, September 15, 2009

## Advanced composites session

- 13:00 Davide Ricci, Italian Institute of Technology, Genova, Italy  
**Carbon Nanotube Coatings and Composites for Biomedical Devices**
- 13:30 David Officer, University of Wollongong, NSW, Australia  
**Nanostructured Organic Conductors: The Impact on Medical Bionics**
- 14:00 Coffee break
- 14:30 Zvi Yaniv, Applied Nanotech, Inc., Austin, USA  
**Improved Mechanical Properties of Carbon and Glass Fiber Reinforced Composites using Carbon Nanotubes**
- 15:00 Harun Erismis, Fraunhofer IPA, Stuttgart, Germany  
**Preparation of CNT-SiO<sub>2</sub> Films and Testing of Their Electrical Behaviour**
- 15:30 Udo Gommel/Markus Rochowicz, Fraunhofer IPA, Stuttgart, Germany  
**Safety and quality aspects of nanomaterials production and handling**
- 16:00 Review and closing words from the Chairman  
**End of the conference**
- 16:30 Closed Workshop  
**Future Topics in the Area of CNT**  
Participation only upon signing an NDA
- 18:00 End of the event

# Chairmen and Speaker

## Chairmen

### Ivica Kolaric

Fraunhofer Institute for Manufacturing Engineering and Automation IPA, Stuttgart, Germany

### Siegmar Roth

Sineurop Nanotech GmbH, Stuttgart/Max Planck Institut für Festkörperforschung, Stuttgart/Korea University, School of Electrical Engineering, WCU Flexible Nanosystems, Seoul, Germany/Korea

### Engelbert Westkämper

Fraunhofer Institute for Manufacturing Engineering and Automation IPA, Stuttgart, Germany

## Speaker

### Horst Adams

Bayer International SA, Fribourg, Switzerland

### Ray Baughman

University of Texas at Dallas, USA

### David Carroll

Wake Forest University, Winston-Salem, USA

### Jin-Hong Du

Institute of Metal Research, Chinese Academy of Sciences, Shanghai, China

### Harun Erismis

Fraunhofer Institute for Manufacturing Engineering and Automation IPA, Stuttgart, Germany

### Carsten Glanz

Fraunhofer Institute for Manufacturing Engineering and Automation IPA, Stuttgart, Germany

### Udo Gommel

Fraunhofer Institute for Manufacturing Engineering and Automation IPA, Stuttgart, Germany

### Mohammad Haque

University of Texas at Dallas, USA

# Speaker

## **Kenji Kiyohara**

National Institute of Advanced Industrial Science and Technology,  
Osaka, Japan

## **Ivica Kolaric**

Fraunhofer Institute for Manufacturing Engineering and  
Automation IPA, Stuttgart, Germany

## **Katsuyoshi Kondoh**

Joining and Welding Research Institute Osaka University, Japan

## **David Officer**

University of Wollongong, NSW, Australia

## **Hye Jin Park**

Max Planck Institut für Festkörperforschung, Stuttgart, Germany

## **Davide Ricci**

Italian Institute of Technology, Genova, Italy

## **Markus Rochowicz**

Fraunhofer Institute for Manufacturing Engineering and  
Automation IPA, Stuttgart, Germany

## **Siegmar Roth**

School of Electrical Engineering, WCU Flexible Nanosystems, Seoul,  
Korea

## **Carlo Taliani**

Institute of Nanostructured Materials, CNR Bologna, Italy

## **Zvi Yaniv**

Applied Nanotech, Inc., Austin, USA

## **Anvar Zakhidov**

University of Texas at Dallas, USA

## **Henning Zoz**

Zoz GmbH, Wenden, Germany

# General Information

## Information and Registration

Conference Office FpF

c/o Fraunhofer IPA

Mrs. Karin Reinert

Nobelstrasse 12

70569 Stuttgart

Phone +49 711 970-1204 | Fax -1877

e-mail [karin.reinert@ipa.fraunhofer.de](mailto:karin.reinert@ipa.fraunhofer.de)

## *For further information contact:*

Ivica Kolaric

Department Process Engineering of Functional Materials

Fraunhofer Institute for Manufacturing Engineering

and Automation IPA

Nobelstrasse 12

70569 Stuttgart

Phone +49 711 970 3729

e-mail [ivica.kolaric@ipa.fraunhofer.de](mailto:ivica.kolaric@ipa.fraunhofer.de)

## Conference Office

September, 14 and 15, 2009, from 8.30 am to 5.00 pm

Phone +49 711 970-1204

## Organization

Verein zur Förderung produktionstechnischer Forschung e.V. (FpF),  
Stuttgart

## Conference Fee

The conference fee is € 990,- per person.

This fee includes the participation in all presentations, conference documents with the presentation material, lunch and refreshments during the conference.

# General Information

## Registration

Please use the attached card for registration or send us an e-mail (karin.reinert@ipa.fraunhofer.de) with your full name, title, address and invoice address, if deviating.

After the registration, the invoice and further information will be sent to you.

Registration deadline is September 2, 2009

## Change of Registration

A change of registration to another participant is possible. Please inform the conference office about the new participant. This service is possible at any time and free of charge.

## Cancellation

We charge € 200,- for cancellation of registrations until 10 days before the conference. After September 4, there will be no refunds.

## Hotels

### relexa Waldhotel Schatten Stuttgart

for reservation by September 13, 2009 mention the keyword »Nanodays 2009«

Magstadter Strasse 2-4

70569 Stuttgart

Phone +49 711 6867-0 | Fax -999

e-mail [Stuttgart@relexa-hotel.de](mailto:Stuttgart@relexa-hotel.de)

Web [http://www.relexa-hotels.de/content/english/viewer/stuttgart\\_start\\_9.html](http://www.relexa-hotels.de/content/english/viewer/stuttgart_start_9.html)

### Telekom Tagungshotel Stuttgart

for reservation by August 28, 2009 mention the reservation number: 36758/1

Universitätsstrasse 34

70569 Stuttgart

International Toll Free Numbers:

Phone +49 800 8330-330 | Fax -331

e-mail [tagungshotel.stuttgart@telekom.de](mailto:tagungshotel.stuttgart@telekom.de)

Web <http://www.tagungshotels.telekom.de/dtag/cms/content/Telekom-Training-Hotels/de/535362>

# General Information

## Travel

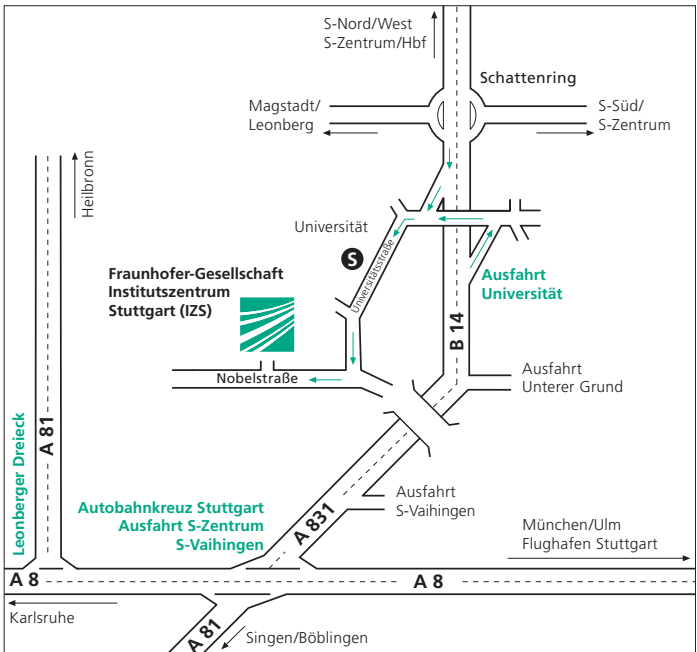
From the Stuttgart Airport you can either take a taxi (approx. € 20,-) or go by S-Bahn (S-Bahn tickets are available at ticket vending machines at each S-Bahn station) to the station »Universität«.

## Conference Location

Fraunhofer Institute  
for Manufacturing Engineering  
and Automation IPA

IZS Campus

Nobelstrasse 12  
70569 Stuttgart (Vaihingen)



## **Registration**

Please return in envelope (see address below) or by fax +49 711 970-1877



# **Fraunhofer**

**IPA**

Conference

September 14 and 15, 2009

## **International Conference Stuttgart Nanodays**

visions for short and medium-term applications

Fraunhofer Institute  
for Manufacturing Engineering  
and Automation IPA

**Verein zur Förderung produktionstech-  
nischer Forschung e. V. (FpF)**  
c/o Fraunhofer IPA  
Mrs. Karin Reinert  
Nobelstrasse 12  
**70569 Stuttgart**  
Germany

September 14 and 15, 2009  
**International Conference  
Stuttgart Nanodays**

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Last Name

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First Name

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Title

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Company

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Department

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Street/P.O. Box

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ZIP Code/City/Country

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Phone/Fax

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E-Mail

**Registration:**

Register for the Fraunhofer IPA Conference  
(Organisation Comitee FpF)

**International Conference  
Stuttgart Nanodays**

visions for short and medium-term applications

September 14 and 15, 2009  
Conference fee € 990,-

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Unterschrift