

# Optical Coatings for Laser Applications

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Andreas Ettemeyer studied Mechanical Engineering in Munich and Aachen and graduated on holographic interferometry in Stuttgart. During nearly 20 years in industry, he concentrated on optical measuring techniques such as holography and speckle interferometry. In 1989 he founded and managed a company for production of laser measuring systems until he moved back to academia in 2005. Today he is professor for Technical Optics at NTB Interstate University of Applied Sciences in Buchs, Switzerland.

### Welcome note



**Prof. Dr. Detlev Ristau**

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Detlev Ristau finished his study of physics at the University of Hannover in 1982. He received his PhD from the University in Hannover in 1988 and a state doctorate in 2008. In 2010 he was appointed as a professor at the Leibniz University in Hannover. He is presently responsible for the Department of Laser Components at the Laser Zentrum Hannover.

### Standardisation in Optics Characterisation

The present contribution will give a short motivation on international standards for laser components and concentrate on selected standards. The historical development of the measurement standard for laser induced damage thresholds will be described. Some aspects on the measurement of optical losses will be presented and the present state and future activities concerning standards for optics characterisation will be summarized.



**Prof. Dr. Thomas Südmeyer**

**Head of Time- Frequency laboratory, Physics Departement, University of Neuchâtel, Switzerland**  
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Thomas Südmeyer studied physics at Leibniz University, Hannover, and ENS, Paris. He received the PhD degree from ETH, for research on the first mode-locked thin-disk lasers and novel nonlinear systems, in 2003. He is the Director of the Physics Department, University of Neuchâtel. In 1999, he started working on ultrafast lasers during an EU fellowship at Strathclyde University (Glasgow). During 2003 to 2005, he developed industrial laser solutions at Sony Corporation, Tokyo. From 2005 to 2011, he investigated new concepts for ultrafast science and technology at ETH, where he received the Habilitation degree. In 2011, he was appointed as Full Professor. He has been the Coordinator of several Swiss and European projects and was awarded with an ERC Starting Grant in 2011.

### Optics: Optical IBS Coatings for Swiss research

With the project OPTICS, the University of Neuchâtel wants to establish a complete solution for the design, sample preparation, layer deposition, characterization, and evaluation of top-quality Ion-Beam Sputtering (IBS) coatings. In this presentation, we will give an overview of the project status. On major focus is optics for ultrafast lasers. State-of-the-art high power ultrafast lasers can operate at multi-kW intracavity average powers and multi-MW intracavity peak powers. This leads to strong demands on the optical components, especially the intra-cavity dispersive mirrors. We will discuss challenges like non linearities, thermal effects, and damage, and compare different approaches to overcome the issues.



**Dr. Roelene Botha**

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Roelene Botha received her PhD degree in Applied Physics at the Ecole Polytechnique, Palaiseau (France) in 2008. Since November 2014 she is a senior research engineer at the Institute for Production Metrology, Materials and Optics (PWO) at NTB Buchs, Switzerland. She is responsible for the LIDT measurement system and the build-up of the RhySearch centre for Optical High End Coatings.

**LIDT Testing at NTB**

As part of a KTI-Project, RhySearch and its partners from the photonics industry have joined forces to install a Laser Induced Damage Threshold (LIDT) measurement facility at the NTB Buchs. The first results from the LIDT Testbench are presented, together with the planned future developments for the RhySearch centre for Optical High End Coatings.



**Prof. Dr. Norbert Kaiser**

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Norbert Kaiser is Professor for Physics and Technology of thin films at Ernst-Abbe Technical University Jena. He heads the Optical Thin Film Department and is Vice Director of the Fraunhofer Institute for Applied Optics and Precision Engineering IOF in Jena.

**Progress on the manufacture of optical coatings**

The design and manufacture of components and systems are worldwide activities in the field of photonics. In most cases, optical coatings perform a key function and dictate the performance of the systems. Nanoscale coatings are providing enormous scope for advances. The ability to generate very high optical powers and to deliver them with low loss and high precision is basic for DUV and EUV lithography and laser technology. Tremendous innovations are also expected from polymer coatings, which exhibit superior functional properties for photonic devices.



**Dr. Gabriel Dumitru**

**Directeur de Division, BCI Group - W. Blösch AG, Grenchen, Switzerland**  
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Dr. Dumitru joined Blösch in 2009 to support the R&D and since 2011 he's heading the Division CIH, which gathers laser ablation, EDM, plastics moulding, PVD coating, electroforming, etc. Previously in academia, Dr. Dumitru acquired experience in laser micromachining and published over 50 articles. He received his PhD in 2002 with a thesis on the laser structuring of coated tribological surfaces.

**Optical Coatings for Watch Parts: Wear resistance and Laser Damage Behaviour**

The fabrication and the testing methods of colourless and scratchproof antireflective coatings on sapphire watch glasses and on other sapphire movement parts are firstly discussed. In the context of combining functional and aesthetics, the laser structuring of antireflective and other PVD coatings is afterwards mentioned, the practical importance of LIDT.



**Dr. Volker Scheuer**

**Managing Director, Naneo Precision IBS Coatings GmbH, Rheinbreitbach, Germany**  
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- 2012 CEO Naneo Precision IBS Coatings GmbH
- 1998-2012 Founder and CEO of Nanolayers Optical Coatings GmbH
- 1994-1998 Head of IBS group at TU Darmstadt
- 1988-1994 Dissertation at TU Darmstadt, Research into sources of absorption in oxide ion beam sputtered optical coatings
- 1986-1988 Research Assistant at University of Kaiserslautern, Project on IBS
- 1980-1986 Physics studies and diploma at TU Darmstadt

**Ion-Beam Sputtering in the Industrial Production**

The most advanced optical coatings are today produced by IBS Deposition. The IBS coatings are outstanding concerning low optical losses and high precision of optical features. The talk introduces into the basics, summaries the breakthroughs and presents the technology of IBS. Examples of IBS optical coatings from different fields of applications are given.



**Dr. Richard  
Quaderer**

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Richard Quaderer hat an der ETH Chemie studiert und hier auch seine Doktorarbeit verfasst. Daran schloss sich ein PostDoc-Aufenthalt an der Brown University in Providence, Rhode Island, in den USA an, der durch den Schweizerischen Nationalfonds finanziert wurde.

Von 2007 bis 2013 arbeitete er in unterschiedlichen Positionen in der Biotechnologischen Forschung der Lonza AG in Visp VS. Berufsbegleitend absolvierte er an der EPFL und der Universität de Lausanne einen Executive-MBA mit dem Schwerpunkt Technologiemanagement (MoT).

Seit dem 1. Dezember 2013 ist Richard Quaderer Geschäftsführer von RhySearch.

**Conclusion**

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