SYOH 7: Poster Optische Hochleistungsbeschichtungen

Zeit: Mittwoch 17:30–18:30 Raum: Poster A

SYOH 7.1 Mi 17:30 Poster A

Damage threshold investigations of high power laser optics under atmospheric and vacuum conditions — •Lars Jensen[1], Marco Jupé[1], Heinrich Mädebach[1], Henrik Ehlers[1], Kai Starke[1], Detlev Ristau[1], Wolfgang Riede[2], Paul Allenspacher[2], and Helmut Schröder[2] — [1]Laser Zentrum Hannover e.V., Hannover, Germany — [2]Deutsches Zentrum für Luft- und Raumfahrt, Stuttgart, Germany

It is well known that optical dielectric coatings show a change in performance when altering the environmental condition from air to vacuum. Evacuating or venting a set-up will shift the spectral characteristic and also the damage behavior of the specimen. With respect to the spectral shift it has been observed that dense dielectric coatings manufactured by Ion Assisted Deposition and Ion Beam Sputtering do not show this modification.

This work was performed to investigate AR coatings of different deposition processes to determine whether the LIDT of dense layers can also be kept stable in vacuum. It was found that the damage threshold of these dense coatings does not decrease in an evacuated environment.

SYOH 7.2 Mi 17:30 Poster A

Improvement in laser irradiation resistance of fs- dielectric optics using silica mixtures — •Marco Jupé, Marc Lappschiess, Lars Jensen, Kai Starke, and Detlev Ristau — Laser Zentrum Hannover e.V., Hannover, Germany

Investigations in fs-laser damage mechanisms within the recent years indicate that damage mechanisms in the fs-range are based on electronic interaction schemes in the material. Usually, a direct correlation of the power handling capability to the band gap structure of the material and the field strength distribution in the optical system is observed. The present work is focused on the optimization of high refractive index coating materials by mixing with silica. The different compositions of mixed materials are manufactured with an IBS coating process using a zone target. This technique allows for a continuous variation of the material composition.

In addition, new coating designs were developed to adapt the contents of silica within the layers to the high field strengths. By combining these techniques a significant increase of the laser damage threshold could be accomplished.

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Optische Komponenten Charakterisierung mit Ultrakurzpulslaser — •Thomas Stubbe, Kai Starke, Lars Jensen, Marco Jupé, Istvan Balasa, and Detlev Ristau — Laser Zentrum Hannover e.V., Hollerithallee 8, 30419 Hannover

Applications of ultrashort pulse laser nowadays are used in areas like medicine, basic research, laser machining and many high other technology fields. The results are high innovation laser tools and the motivation to turn these results into compact and high efficiency laser systems and into economic success. Because of the fast development in the optical components have to keep pace with the rapid evolution of requirements which are produced in a regular production chain. Therefore to obtain the ability to compete with other foreign countries, the cooperative project OKuLas, Optische Komponenten für Ultrakurzpulslaser starts to fix the numerated problems. The Laser Zentrum Hannover (LZH), in cooperations with LINOS, started to work on nonlinear absorption with ultra short pulsed Lasers. The difference compared to other absorption experiments at the LZH is that volume optics will be measured. Due to different geometrical crystals, two mounts are in a design process and will be tested to study if there is a difference in convection or the direct contact on the temperature sensors. Also a demonstration of a test set-up for a standardized absorption measurement of crystals in u.s.p. laser systems will be shown. Results will be presented as well as recently conducted results concerned to LC of coated fs -optics.

SYOH 7.4 Mi 17:30 Poster A

Photocatalytical measurements with thin films of evaporated stearic acid — •Thomas Neubert, Wenzao Sun, Frank Neumann, and Michael Vergöhl — Fraunhofer Institute for Surface Engineering and Thin Films, Bienroder Weg 54E, 38108 Braunschweig, Germany

We show a simple and quantitative method for the measurement of the photocatalytic activity of transparent layers. Such photocatalytic layers could be used for selfcleaning optical devices such as mirrors or lenses. The developed measuring method uses thin films of evaporated stearic acid as a well defined organic pollution. These films show a good homogeneity of the thickness and a high scattering of the visible light. A good correlation between the area-related mass and the optical haze of the stearic acid films was found. So the decomposition of the stearic acid by UV-light can be observed by optical haze measurements. From the change of the haze value with time a decomposition rate and from this in turn a photocatalytic activity can be calculated. Advantages of this method are the good reproducibility and simplicity, the possibility to use multiple photocatalytic substrates, a measuring time of less than an hour for samples with a good activity and the use of a non toxic and inexpensive organic material such as stearic acid.

SYOH 7.5 Mi 17:30 Poster A

Reaktives Sputtern von SiO_xN_y-Schichten für optische Filter — Jörn Weber, •Peter Frach und Hagen Bartzsch — Fraunhofer-Institut für Elektronenstrahl- und Plasmatechnik, Winterbergstr. 28, 01277 Dresden, Deutschland

Der Brechungsindex von Silizium-Oxinitrid (SiO_xN_y)-Schichten lässt sich innerhalb eines weiten Bereiches zwischen 1.46 und 2.08 einstellen. Diese Schichten eignen sich deshalb für den Einsatz in Dünnschichtfiltern. Reaktives Puls Magnetron Sputtern (PMS) ermöglicht die Hochrateabscheidung dieser Schichten mit einstellbarer Brechzahl durch Änderung der Zusammensetzung des Reaktivgases während des Beschichtungsprozesses. Die Beschichtungsraten liegen dabei entsprechend der Leistung innerhalb eines Bereichs zwischen 50 und 240 $\frac{nm}{min}$. Mit dieser Technologie lassen sich ohne Prozessunterbrechung an einer Prozessstation durch Gaswechsel Antireflex(AR)- und Filterschichtsysteme abscheiden. Diese können bei schnellem Wechsel der Reaktivgase als HL-Schichtsystem oder bei zeitlich präzise gesteuertem, kontinuierlichem Gaswechsel als Gradientenschichtsysteme abgeschieden werden. Damit ist die leistungsfähige Abscheidung von rugaten Filtern mit völlig neuen optischen Designmöglichkeiten gegeben. Die Schichtsysteme zeichnen sich durch ihre geringe Rauheit, hohe Dichte und sehr gute Temperatur- und Feuchtebeständigkeit aus. Am Beispiel der AR-Beschichtung von Brillenlinsen wird die gute Schichthaftung bei niedriger prozessbedingter Temperaturbelastung auf Kunststoffen demonstriert. Die Eignung für Laserapplikationen mit hoher Energiedichte konnte nachgewiesen werden.