TECHNISCHE UNIVERSITÄT CHEMNITZ

PHYSIKALISCHES KOLLOQUIUM

Mittwoch, den 15.12.2010, um **15:30 Uhr**

Ort: Reichenhainer Str. 90; Neues Hörsaalgebäude, Raum: 2/N013

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Optical Applications of Atomic Layer Deposition Thin Films

Atomic layer deposition (ALD) is a powerful technique to produce ultra-thin coatings of a large variety of materials. The deposition of oxides, nitrides, fluorides, sulfides, and metals is readily available by ALD. The film growth is self-limited by surface reactions allowing for a precise control of the thickness of the ALD coatings and excellent uniformity and conformal deposition on high aspect ratio substrates. The deposition proceeds at substrate temperatures lower than typically used in chemical vapor deposition making it possible to coat temperature sensitive materials. ALD coatings find application in TFEL (thin-film electroluminescent) displays, microelectronics, opto-electronics, catalysis, optics, etc.

This talk will address optical applications of ALD coatings. Functional coatings were achieved for various optical elements. X-ray mirrors and Fresnel zone plates were demonstrated based on nanolaminates consisting of Ta2O5 and Al2O3 layers. Interference optics for the visible spectral range such as antireflective coatings and bandpass filters will be presented. For the bandpass filters, simulations have been performed in advance to calculate the required thicknesses and number of the alternating films in order to tune the filtering properties as a function of the wavelength. With a very narrow transmission, the filter can be easily tuned between wavelengths of 440 and 500 nm.

Guided-mode resonance (GMR) optics such as optical filters and sensors will be discussed in detail. The optical function of the coated nanostructures was modeled by rigorous coupled wave approach calculations. Two-dimensional nanostructured polycarbonate (PC) substrates with 280 nm period and hexagonal lattice were coated by ALD to produce tunable guided-mode resonance filters with narrow reflectance peaks in the visible. The sensitivity of the GMR sensors was optimized as function of the height of the nanostructures. The experimental data showed a 4 nm shift of several narrow GMR peaks for an analyte layer with a thickness of 1 nm providing a highly sensitive and robust sensor element. Finally, a flexible, nondestructive replication of high aspect ratio nanostructures for polarizer diffractive optical elements will be presented.

Alle Zuhörer sind ab 15:15 Uhr zum Kaffee vor dem Hörsaal eingeladen.

Informationen zum Vortrag erteilt Prof. Dr. Dietrich Zahn , Tel. 0371/531-33036