SYOS 3: Plasma und Optische Technologien III

Zeit: Dienstag 16:30–17:30 Raum: HS 4

Hauptvortrag SYOS 3.1 Di 16:30 HS 4

Design von amorphen optischen Schutzschichten mittels Multiskalenmodellierung — •Thomas Frauenheim — Bremer Center for Computational Materials Science, Universität Bremen

Klassische, quantenmechanische Einteilchen- und Vielteilchenkonzepte werden mit dem Ziel verbunden, binäre und ternäre optische Metalloxid-Schichten mit gewünschten optischen Parametern mittels Computermodellierung maßzuschneidern.

SYOS 3.2 Di 17:00 HS 4

Thin film deposition on flat surface using atmospheric pressure plasma source: influence of C:H ratio on film properties — •Ramasamy Pothiraja[1], Max Engelhardt[1], Björn Offerhaus[1], Nikita Bibinov[1], Jan Perne[2], and Peter Awakowicz[1] — [1]Institute for Electrical Engineering and Plasma Technology, Ruhr-University Bochum, 44801 Bochum, Germany. — [2]Institut für Oberflächentechnik, RWTH Aachen University, Germany.

Hydrocarbon films are deposited on flat glass substrate using filamentary plasma discharge ignited in Ar-CH4, Ar-C2H2-H2 and Ar-C2H2 gas mixtures at atmospheric pressure. Deposited films have been characterized using FTIR-ATR, SEM, XPS and hardness measurements. When CH4 or C2H2-3H2 (C:H ratio 1:4) mixture is used as a precursor, film is deposited completely covering substrate surface, and deposition rate is low. Usage of only C2H2 (C:H ratio 1:1) in argon plasma results in the deposition of flakes like porous materials which are grown perpendicular to the surface of glass substrate. This material has higher reactivity towards atmospheric nitrogen than the material which is deposited from either CH4 or C2H2-3H2 precursor. Hardness of films obtained from CH4 as well as C2H2-3H2 precursors under similar conditions are comparable to each other, and harder than the film obtained from C2H2 precursor. In addition to these, plasma parameters are determined for Ar-N2 plasma ignited under similar experimental condition adopted for film deposition process. Nitrogen is used as a sensor gas. Plasma parameters are determined from the OES, voltage current measurement, micro-photography, and numerical simulation.

SYOS 3.3 Di 17:15 HS 4

Reactive co-sputtering processes in Ar:H2S and Ar:H2Se to deposit chalcopyrite absorber layers for thin film solar cells — •Jonas Krause, Man Nie, Karsten Harbauer, and Klaus Ellmer — HZB Berlin GmbH Hahn-Meitner-Platz 1 14109 Berlin

Reactive magnetron co-sputtering from two targets (CuGa and In) was used to deposit Cu(In,Ga)(S,Se)2 layers as absorbers for thin film solar cells. The good quality of such films has already been proven for CuInS2, where an efficiency of 11.4% has been achieved which is the same as for other preparation techniques. Recently, we extended our experimental environment enabling reactive processes also with Ar:H2Se, in order to deposit selenide chalcopyrites, an absorber material which showed, deposited by other techniques, high efficiencies exceeding 20%. In the first experiments we varied the reactive gas content and the substrate temperature. In addition to comparing the discharge parameters of different Ar-to-reactive-gas ratios, we analyzed the deposited films by XRD, XRF and SEM. We found that the discharge conditions, characterized by the discharge voltage, do not change significantly if H2S is exchanged by H2Se. However by using H2Se a lower percentage of reactive gas is necessary in order to achieve fully selenized films in comparison to the sulfurization in a comparable Ar:H2S process. Furthermore, we also see that the sputtering rate of the metals is significantly influenced by the percentage of reactive gas. The results of the first solar cells processed with absorber layers from this first depositions in Ar:H2Se are promising and show the opportunities of reactive co-sputtering of electronically active films for solar cells.