TECHNISCHE UNIVERSITÄT CHEMNITZ

PHYSIKALISCHES KOLLOQUIUM

Mittwoch, den 12.05.2010, um **15:30 Uhr**

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

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Printable TCO Thin Films for Electronic Devices

TCO nano-dispersions or liquid precursors are considered for low-cost-low-temperature processing, like printing, as an alternative to plasma or vacuum based coating technologies. In this talk, the properties of ITO nanoparticle thin films for printable transparent electrodes as well as ZnO thin films prepared from liquid precursors or nanodispersions for transistor applications will be presented. The talk summarizes our work on several strategies:
(1) ITO nanoparticle thin films prepared from nano-dispersions with subsequent annealing steps in order to remove organic additives,
(2) ITO nanoparticle thin films where the particles are embedded in a conductive polymer matrix without subsequent annealing,
(3) ZnO nano-dispersions with polymeric additives to improve the layer morphology
(4) ZnO thin films prepared from aqueous solutions.
In case (1) the effect of post-heat treatment of indium-tin-oxide nanopowders in reducing atmosphere on defect structure, electrical resistivity and transparency will be considered. The formation of Indium segregation under reducing atmosphere has been detected very sensitively by susceptibility measurements utilizing the superconducting properties of indium.
In case(2), a hybride system of ITO and conducting polymer PEDT/PSS was investigated. A decrease in electrical conductivity of PEDT with increasing ITO content up to a volume fraction of about 16 vol % is observed. The results are discussed with respect to changes in the infrared polaron and bipolaron absorption of PEDT and morphological changes. Despite a charge transfer between the n-type ITO particles and the p-type PEDT/PSS seems possible, the strong reduction in conductivity is mainly assigned to morphological changes. Above the volume fraction of 16 vol % the conductivity increases very steeply, most probably due to percolation between the ITO-nanoparticles. A phase separation at higher ITO content makes this system non-applicable for thin film preparation.
In case (3) thin films of ZnO nanoparticles with PVP are investigated in thin film transistors. Despite PVP is an insulating polymer, the device parameters are enhanced under certain conditions. The effect of PVP content and solvent on the device performance will be discussed.
Finally, in case (4) we demonstrate a way to produce ZnO thin film transistors at moderate temperatures from an aqueous solution with mobilities larger than 1 cm2/Vs.

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