DS 4: Atomic Layer Deposition

Time: Monday 12:15–13:00 Location: H8

DS 4.1 Mon 12:15 H8

Realization of platinum 3D nanostructures using an improved atomic layer deposition process — •Yan Mi, Liaoyong Wen, ChengLiang Wang, Huaping Zhao, and Yong Lei — Fachgebiet 3D-Nanostrukturierung, Institut für Physik & IMN MacroNano (ZIK), Technische Universität Ilmenau, Prof. Schmidt Str. 26, 98693 Ilmenau, Germany.

Uniform deposition of metals onto high surface area of porous media is a key challenge for developing efficient catalysts and conducting layers. Self-limiting atomic layer deposition (ALD) provides excellent capabilities for depositing materials on large surface area. In this talk, we explored innovative three-dimensional (3D) surface nano-structuring technique to synthesize highly ordered functional nano-patterns with wide potential applications. The surfaces of as-prepared 3D nanostructures were further functionalized with platinum by ALD. Before the ALD process, the sample surface was modified by O2 plasma process. It is found that plasma-assisted ALD process intensively enhanced the quality of platinum, resulting in well-dispersed platinum nanoparticles and homogeneous continuous platinum nanotubes on highly ordered 3D nano-pattern surface. All these structural advantages make these 3D nanostructures highly desirable for catalysts and conducting layers.

DS 4.2 Mon 12:30 H8

Atomic layer deposition of Ga2O3 using Tri-methyl-Gallium and H2O — •Sakeb Hasan Choudhury, Massimo Tallarida, Chittaranjan Das, and Dieter Schmeisser — Brandenburg University of Technology, Applied Physics-Sensors technology, Konrad-Wacshmann-Allee, 17, 03046 Cottbus, Germany

Considering numerous applications such as transparent conducting oxides, gas sensors, photovoltaic applications, deep UV photo detectors, field effect transistors and spintronics gallium oxide (Ga2O3) has earned quite a lot of focus recently. Various techniques have already been demonstrated to produce Ga2O3 naming evaporation, sputtering, pulsed laser deposition, chemical vapor deposition and atomic layer deposition (ALD). Among them, ALD gives the possibility of controlling the thickness at the atomic level, good step coverage and delivers dense and homogeneous films. In this contribution, we report on the growth of ALD Ga2O3 using trimethylgallium (TMG) and H2O as metal and oxygen precursors, respectively. We deposited thin Ga2O3 films on Si, TiO2, Al2O3 and RuO2 over a temperature range of 150-300°C and characterized them by X-ray photo emission spectroscopy and atomic force microscopy. From this study, we are able to discuss the influence of the temperature on the growth dynamics of Ga2O3 and its chemical composition.

DS 4.3 Mon 12:45 H8

An efficient Si photo cathode for a wide range of electrolyte pH values — •Chittaranjan Das[1], Massimo Tallarida[1], Katarzyna Skorupska[2], Hans-Joachim Lewerenz[2,3], and Dieter Schmeisser[1] — [1]Applied physics and sensors,BTU Cottbus, Germany — [2]Institute for Solar Fuels and Energy Storage Materials,HZB, Berlin , Germany — [3]California Institute of Technology, 1200 East California, Pasadena , USA

Hydrogen fuel cells, being environmental friendly to produce energy, are a technology of future. One of the efficient ways to produce hydrogen is solar driven photocatalysis using semiconducting materials as photo electrodes. The choice of electrodes is a crucial factor and is done on the basis of photo corrosion stability, light absorption efficiency, and photocarrier lifetime. P-type Si can be used as photo cathode to produce H2 by direct photocatalysis. Si cathodes can be used in acidic electrolytes to have efficient photo catalytic activity but they are unstable in alkaline electrolytes. Therefore, to use both Si electrodes in the same electrolyte, their chemical stability should be extended over a wide range of pH. To this purpose we modified the surface of a p-type Si photocathode with very thin films of TiO2 grown by atomic layer deposition (ALD). We found that the modified Si cathode shows an increased photoresponse and a lower onset potential with respect to the pristine surface and an increased stability at various pH values.