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Assessments of uniformity of Pt nanoparticles distribution and granulometric composition of Pt/C nanostructured materials using thermal analysis

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High-temperature oxidation processes of Pt/C nanostructured materials were studied by thermogravimetric analysis and differential scanning calorimetry. The presence of different specific temperature ranges in the thermograms for the oxidation of Vulcan XC72, TIMREX HSAG 300, and Taunit nanofiber was shown to be due to both the peculiarities of granulometric composition of carbon supports and uneven spatial distribution of platinum nanoparticles. In the present study, a model for the high-temperature oxidation is proposed as an analysis tool for carbon support (Vulcan XC72) oxidation catalyzed by platinum nanoparticles. This analysis is expected to be effectively utilized in order to assess the uniformity of platinum distribution on carbon microparticles, provide additional information about granulometric composition of carbon microparticles, and composition of Pt/C nanostructured materials. Thus, we believe that this analysis can be used to preselect the most effective Pt/C nanostructured electrocatalysts for low temperature fuel cells.

Biography

Weldegebriel Yohannes Gebretsadik pursued his PhD at the age of 31 years from Southern Federal University, Faculty of Chemistry, Rostov, Russia. He is a Lecturer at Addis Ababa University, college of Natural sciences, Chemistry Department, Addis Ababa, Ethiopia.

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Fabrication of 3-D nanostructured and solution processed CIGS thin film solar cells

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In this presentation, the fabrication of CuInGaS₂ (CIGS) thin film solar cells with a three dimensional (3-D) nanostructure based on indium tin oxide (ITO) nanorod films and precursor solutions (Cu, In, and Ga nitrates in alcohol) is demonstrated. To achieve 3-D nanostructured and solution processed CIGS thin film solar cells, ITO nanorod substrate was used as a back contact electrode. The precursor solution of Cu, In, and Ga without binder material was then drop-casted followed by ultrasonic vibration to completely fill the gaps between ITO nanorods. ITO nanorods were embedded in the second precursor solution with polymer binder was spin-coated to increase the thickness of the CIGS films. Subsequent annealing processes in air as well as sulfur environment resulted in polycrystalline CIGS film. The structures, morphology, optical property and quantum efficiency were investigated by XRD, SEM, UV-Vis absorption and spectral IPCE measurements. Solar cell device with Al, Ni/AZO/i-ZnO/CdS/CIGS/ITO nanorods/glass structure was fabricated showing the power conversion efficiency of 6.3% at standard irradiation conditions, which is 22.5% higher compared to the identical solar cells with planar ITO substrate. The details of fabrication method and characteristics of the solar cells will be discussed in the presentation.

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