



Contribution ID: 248

Type: Invited Speaker

Effects of Electric and Magnetic Fields on Nanoparticle Thin Films Prepared by Sparking-off Metal Tips

Monday 28 November 2016 15:00 (20 minutes)

Nanomaterials have a vast range of applications in various fields due to their superior properties. There are a number of methods for nanoparticle-thin film coatings, for example spray pyrolysis, electrodeposition, spin coating and sol-gel process. However, these methods are either time consuming or require the use of toxic substances. The sparking method can be used to prepare nanoparticles and nanoparticle-thin films by applying a high voltage across any two metal wire tips. This talk will cover the effects of electric and magnetic fields on film morphology and crystalline phase formation. Preparation and characterization of ZnO, TiO₂, In₂O₃, FeN nanoparticle-thin films will be presented. It was found that the electric and magnetic fields enhanced the growth rate and uniformity of the films, whereas the magnetic field also altered the phase formation. Investigations of the sparked nanoparticles or nanoparticle-thin films as a photo-catalyst in dye-sensitized solar cells, a self-cleaning glass and a volatile organic compound sensor will be reviewed. A commercial lab-scale instrument of the sparking method from Nanogeneration Co., Ltd. as a spin-off company will be also demonstrated.

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Session Classification: Falcon 1

Track Classification: Nanomaterials & nanostructures