index of the films. The optical band gap of the spray-deposited CuO films was in the range of 1.4-1.7 eV. All films exhibited high solar absorptance (94%). The obtained Ni:Co:CuO thin films could be a promising candidate for solar absorber layers and optoelectronics.

PP-11

One-step fabrication of high aspect ratio TiO_2 nanorod arrays: Effect of Titanium precursor source

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TiO_2-based nanostructures have been widely explored as photoanodes for dye-sensitized solar cells (DSSCs) because of their favorable band gap and corresponding compatibility with various sensitizers (dye molecules). In this study, a facile one-step method for the fabrication of TiO_2 nanorod arrays (NRAs) on FTO for Dye-sensitized solar cells (DSSC) or Perovskite Solar cells (PSC) is reported. Titanium tetra-isopropoxide (TTIP), Titanium trichloride ($TiCl_3$), Titanium tetrachloride ($TiCl_4$), and Titanium (IV) butoxide were used as various titanium precursor sources. The microstructure and optical properties of the samples were characterized respectively by means of X-ray diffraction (XRD), scanning electron microscopy (SEM), and UV-vis spectrometer. SEM images demonstrate uniformly oriented rod-like structures in all the films. The SEM images of the cross-sectional view confirm the high dependency of the NRAs growth rate on the precursor source. The maximum growth rate (8.5 nm/min) of NRAs was obtained when TTIP was used as a precursor source. XRD pattern of the NRAs confirms the rutile structure of as-deposited TiO_2 NRAs.

PP-12

Zinc manganese oxide nano-composites preparation in the framework filter paper for aqueous rechargeable zinc-ion batteries

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Zinc cobalt oxide ($ZnCo_2O_4$) was synthesized using the raw materials zinc acetate and cobalt acetate. The easily accessible cellulosic paper known as Whatman filter paper acted as a scaffold for the solid state reaction of the raw materials. During the early stage of the reaction, successive amounts of aqueous solutions of the raw materials zinc acetate and manganese acetate were absorbed into the cellulose matrix. Then, cellulose matrix grafted with zinc and manganese ions was calcined at 700°C to produce $ZnMn_2O_4$ powder. The synthesized $ZnMn_2O_4$ materials were subsequently characterized using X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM), energy dispersive X-ray spectroscopy (EDS), and Fourier transform infrared spectroscopy (FTIR). Using JCPDF file No. 24-1133, $ZnMn_2O_4$-related peaks were found, conclusively demonstrating the complete formation of the spinel structure. FESEM pictures proved that