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Morphological and Structural Characterization of TiO_2/Nb_2O_5 Composite Electrode Thin Films Synthesized by Electrophoretic Deposition (EPD) Technique

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Composite electrodes of titanium dioxide (TiO_2) and niobium (v) oxide (Nb_2O_5) have been deposited onto glass substrates by electrophoretic deposition (EPD) technique. The mechanism of EPD involves charged particles in a liquid suspension being forced to move towards and deposit on an oppositely charged electrode upon application of electric field. In this study, TiO_2 and Nb_2O_5 nano-sized powders were suspended in a Pyrex glass containing propan-2-ol. Magnesium nitrate hexahydrate ($Mg(NO_3).6H_2O$) pellets were added to the suspension to induce surface charges on the metal oxides. The structure of the thin films was characterized by X-ray Diffraction (XRD) while morphology was characterized by Scanning Electron Microscope (SEM). The XRD spectra indicated that the films are of polycrystalline nature and that TiO_2 and Nb_2O_5 particles were present in the deposited composite film. Transmittance of the deposited films was measured using the UV-Vis-NIR spectrophotometer spectra in the range 200 to 3200nm. The visual inspection of the films and the morphological investigations from SEM showed that porous films of high quality with well controlled morphology can be deposited using the EPD technique. Further work is needed to evaluate the potential of TiO_2/Nb_2O_5 composite electrode thin films deposited by EPD for dye-sensitized solar cells applications.

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