

A comparative study on optical properties of silver doped and silver decorated TiO₂ thin films prepared by sol-gel dip-coating method

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Abstract

In this study, silver doped and silver decorated TiO₂ thin films were prepared by sol-gel dip-coating method. Silver nitrate was dissolved in the TiO₂ sol to obtain Ag-doped samples with different dopant concentration. The silver decorated TiO₂ samples were prepared by dip-coating pure TiO₂ thin film in AgNO₃ aqueous solution. Thermal decomposition of AgNO₃ at 414 °C was the idea to prepare silver decorated TiO₂ thin films and coated samples were annealed at different temperatures. The structure and composition of prepared samples were characterized by X-Ray diffraction (XRD) and X-Ray photoelectron spectroscopy (XPS). The optical transmission spectra of the samples were measured using UV-Vis spectroscopy. The refractive index of thin films was recorded by NKD. The optical band gap was calculated using Tauc plot (variation of $(\alpha h\nu)^{0.5}$ with $h\nu$), obtained from the absorption spectra of the samples. Surprisingly, it was observed that silver cations were reduced to metallic silver in sample which was annealed at 120 °C [1]. The high band gap value of pure and silver doped TiO₂ thin films are attributed to thermal stress effects produced in the films [2-5].

References

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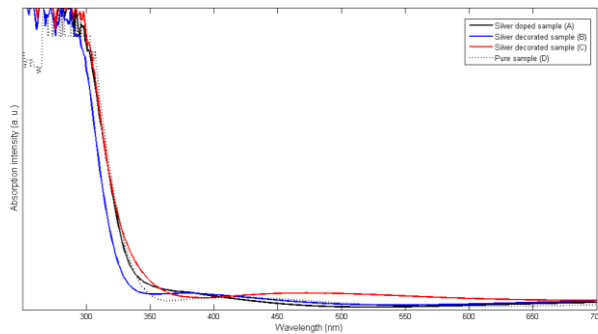


Figure 1 UV-Vis absorption spectra of prepared samples

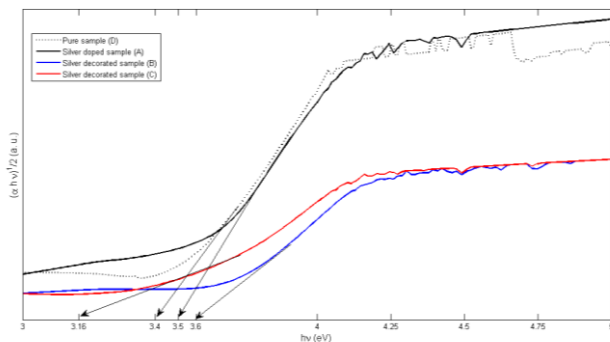


Figure 2 Tauc plot of prepared samples