

Silver selenite in sol-gel derived titania matrix

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We have made a comparative study of electronic property tuning via doping with low band gap nanocomposite material into nanocrystalline high band gap material. Titanium di-oxide (TiO₂, band gap 3.2eV) were prepared using the sol-gel method and pre-synthesised silver selenite (Ag₂Se₃, band gap 1.2eV) nanocomposites were incorporated into the matrix during hydrolysis. The process of incorporation of dopants into the sol-gel matrix was evaluated by X ray diffraction analysis and AFM, SEM. Sandwiched thin film of pristine and doped matrix (50nm) between ITO and Al electrodes exhibited a change in DC conductivity by two orders in magnitude. Apart from its significant changes in AC conductivity; the doped matrix showed dramatic transition in electronic behavior from 200K to 225K which is reflected in its dipole moment distribution in the matrix. This phenomena presumably originating from the titania matrix resulted in significant change in inter-cluster hopping and modulation in carrier transport modulation. The effect of nanocomposites doping on the dielectric relaxation of the matrix were also considered.