

Enhancement of electrical conduction of WO₃ incorporated TiO₂ due to sintering

It is well known that the incorporation of higher valence (>4) cations into the crystal structure of TiO₂ improves the electrical conduction properties. This is studied and further enhancement of electrical conduction due to sintering is discovered.

TiO₂ (rutile structure) was doped using WO₃ (6% by weight) as the dopant precursor and by

The method of high temperature (900 ° C) diffusion. Doped samples were compressed (~ 400 atm) between carbon electrodes to make pellets and the pellets were sintered overnight at different temperatures (from 110° C- 350 ° C) in a vacuum. The variation of electrical conductivity of each sample with temperature was studied.

The conductivity depends significantly on the sintered temperature. The highest conductivity was observed when the sintered temperature was the lowest. The conductivity of the doped sample sintered at 130 ° C ($7 \times 10^{-4} \Omega^{-1} \text{cm}^{-1}$) was about four

orders of magnitude higher than that of sintered at 350 ° C which was about two orders higher than the undoped sample. For a sample sintered at a given temperature, conductivity varies according to an Arrhenius type relation for temperatures below the sintered temperature. Similar features, with lower conductivities, were observed when the samples were sintered in air. Activation energy varies significantly with the sintering temperature. The lowest (0.41 eV) and the highest (1.05 eV) activation energies were obtained when the samples were heated overnight at 130 ° C and 350 ° C, respectively.