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Dielectric properties of TiO₂ and Zr-doped TiO₂ thin films CHANDRA THAPA, SUDAKAR CHANDRAN, SAHANA M.B., Wayne State University, VAMAN NAIK, University of Michigan-Dearborn, KARUR PADMANABHAN, RATNA NAIK, Wayne State University — The leakage current and photocatalytic performance of TiO₂ can be improved by properly doping Ti with other transition metal cations. For example, Zr⁴⁺ doping for Ti⁴⁺ can significantly improve the desired properties. We have studied the properties of pure TiO₂ and Zr-doped TiO₂ thin films prepared by MOD technique and annealed from 650 to 950°C. Both XRD and Raman spectra show TiO₂ to be mostly in anatase form below the annealing temperature of 850°C and in rutile phase above 850°C. However, the Zr doping does not lead to rutile phase formation. We have studied I-V characteristics and frequency dependence of dielectric constants of pure and Zr-doped TiO₂ in the frequency range of 100Hz–1MHz. We find an improvement in leakage current with increasing annealing temperature from 650 to 950°C for both TiO₂ and Zr-doped TiO₂, but no appreciable improvement in the leakage current upon Zr doping. The dielectric constant of pure TiO₂ films improves from 30 to 80 with increasing annealing temperature, whereas that of Zr-doped TiO₂ is independent of annealing temperature and its value is ~50 at 30 kHz. This may be attributed to the persistence of anatase phase of TiO₂ over wide range of annealing temperatures for Zr-doping. These properties and their implications for different applications will be discussed.

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