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Ferromagnetic properties of anatase $\text{Ti}_{1-x}\text{Fe}_x\text{O}_{2-\delta}$ thin films grown by sol–gel method

Kwang Joo Kim^{a,*}, Young Ran Park^a, Geun Young Ahn^b, Chul Sung Kim^b, Jae Yun Park^c

^a*Department of Physics, Konkuk University, Seoul 143-701, South Korea*

^b*Department of Physics, Kookmin University, Seoul 136-702, South Korea*

^c*Department of Materials Science and Engineering, University of Incheon, Incheon 402-749, South Korea*

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Abstract

Magnetic and electronic properties of Fe-doped anatase $\text{TiO}_{2-\delta}$ thin films grown by a sol–gel method have been investigated by vibrating-sample magnetometry (VSM), conversion electron Mössbauer spectroscopy (CEMS), and Hall effect measurements. VSM measurements revealed that the anatase $\text{Ti}_{1-x}\text{Fe}_x\text{O}_{2-\delta}$ films exhibit ferromagnetic behavior at room temperature for a certain range of x . CEMS spectra revealed that Fe^{2+} and Fe^{3+} ions coexist, substituting the octahedral Ti^{4+} sites. By appropriate Fe doping, the $\text{Ti}_{1-x}\text{Fe}_x\text{O}_{2-\delta}$ films exhibited p-type character but the observed room-temperature ferromagnetism turned out to be independent of the hole concentration.

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