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Terahertz Spectroscopic Investigation of Lanthanide-Doped Nano-TiO(2)

Source

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Abstract

Lanthanide-doped nano-TiO(2) samples with different Ti/Ln (Ln = Ce, Nd, and Sm) were synthesized by sol-gel method. The samples were characterized by X-ray diffraction(XRD), Fourier transform infrared spectroscopy (FTIR), X-ray photoelectron spectroscopy(XPS) and terahertz time-domain spectroscopy (THz-TDS). The results indicate that C,e, Nd, and Sm ions were uniformly dispersed into the TiO(2); and the infrared activities of lanthanide-deped nano-TiO(2) were much stronger than Undoped nano-TiO(2), the refractive index of anatase TiO(2) declines with frequency increasing in the frequency range of 0. 2 similar to 1. 70 THz at room temperature, and it exhibits anomalous dispersion. Unique characteristic absorption peaks at 1. 35 and 1. 58 THz were observed from Ce-doped nano-TiO(2). Compared with undoped nano-TiO(2), the absorption edges of C,e-doped nano-TiO(2) were red-shifted remarkably and those of Nd and Sm ions doped nano-TiO(2) were blue-shifted. Sm-doped nano-TiO(2) has induced the least dielectric losses in the frequency range of 0. 2 similar to 1. 7 THz, and the average value is 0. 05.