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Title:Terahertz spectroscopic investigation of lanthanide-doped nano-TiO2

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Abstract:Lanthanide-doped nano-TiO2 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 Ce, Nd, and Sm ions were uniformly dispersed into the TiO2; and the infrared activities of lanthanide-deped nano-TiO2 were much stronger than Undoped nano-TiO2, the refractive index of anatase TiO2 declines with frequency increasing in the frequency range of 0.2~1.70 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-TiO2. Compared with undoped nano-TiO2, the absorption edges of Ce-doped nano-TiO2 were red-shifted remarkably and those of Nd and Sm ions doped nano-TiO2 were blue-shifted. Sm-doped nano-TiO2 has induced the least dielectric losses in the frequency range of 0.2~1.7 THz, and the average value is 0.05.

Number of references:15