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PROCEEDINGS PAPER

**Temperature dependence of photoluminescence, Raman scattering, and transmittance spectra of anatase  $Ti_{1-x}Fe_xO_2$  nanocrystalline films**

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Published: **16 February 2011**; 5 pages; 111 papers;  
DOI: **10.1117/12.888287**

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**Paper Abstract**

Anatase  $Ti_{1-x}Fe_xO_2$  ( $x=0, 1\%, 2\%$ ) nanocrystalline films were prepared on quartz substrates by a facile nonhydrolytic sol-gel route. The structure and optical properties have been studied by X-ray diffraction (XRD), Raman scattering, transmittance spectra and temperature dependent photoluminescence (PL). The  $B_{1g}$ ,  $E_g$  and  $(A_{1g}+B_{1g})$  modes of anatase phase  $TiO_2$  can be observed in Raman spectra. Dielectric functions have been extracted by fitting the transmittance spectra in the photon energy range of 0.5-6.5 eV with [Adachi's](#) model. The pure  $TiO_2$  film displays a strong broadening visible luminescence band; however, Fe-doped samples exhibit a very weak luminescence due to the increase of oxygen vacancy concentration in  $TiO_2$ . With the temperature increases, the PL intensity decreases monotonously and there are five emission peaks for the pure sample in low temperatures, which could be attributed to oxygen vacancies, surface states and  $F^+$  center.

This paper was published in SPIE Proceedings Vol. 7995  
Seventh International Conference on Thin Film Physics and Applications, Junhao Chu; [Zhanshan Wang](#), Editors, 799511

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