

Appl. Phys. Lett. **93**, 181910 (2008); <http://dx.doi.org/10.1063/1.3021074> (3 pages)

Optical properties of pulsed laser deposited rutile titanium dioxide films on quartz substrates determined by Raman scattering and transmittance spectra

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(Received 1 September 2008; accepted 20 October 2008; published online 6 November 2008)

Optical response of rutile TiO₂ films grown under different laser energy by pulsed laser deposition has been investigated by Raman scattering and spectral transmittance. Dielectric functions in the photon energy range of 1.24–6.5 eV have been extracted by fitting the experimental data with the Adachi's model [S. Adachi Phys. Rev. B **35**, 7454 (1987)]. The refractive index dispersion in the transparent region is mainly ascribed to the higher A₁-A₂ electronic transitions for the rutile TiO₂ films. Owing to slightly different crystalline structures and film densities, the optical band gap linearly increases with increasing packing density. The phenomena were confirmed by different theoretical evaluation methods.

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KEYWORDS and PACS

Keywords

dielectric function, energy gap, pulsed laser deposition, Raman spectra, refractive index, thin films, titanium compounds

PACS

78.66.Nk
Insulators

81.15.Fg
Pulsed laser ablation deposition

77.22.Ch
Permittivity (dielectric function)

78.20.Ci
Optical constants (including refractive index, complex dielectric constant, absorption, reflection and transmission coefficients, emissivity)

77.84.Bw
Elements, oxides, nitrides, borides, carbides, chalcogenides, etc.

ARTICLE DATA

Digital Object Identifier

<http://dx.doi.org/10.1063/1.3021074>

PUBLICATION DATA

ISSN

 0003-6951 (print)
1077-3118 (online)

Publisher

American Institute of Physics



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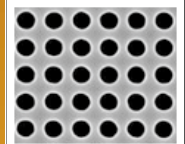
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