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Optical properties of Fe-doped BaTiO₃ films deposited on quartz substrates by sol-gel method (Article)

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抄録 (Abstract)

参考文献を表示 (38)

Fe-doped BaTiO₃ films were prepared on quartz substrates by sol-gel route. Linearly optical constants of the films were obtained by fitting transmittance spectra with **Adachi's model**. With increasing Fe composition, refractive index n at 532 nm increases, single oscillator energy E_c and dispersion energy E_d increase, but optical band gap E_g decreases from 3.78 to 3.63 eV. In addition, nonlinear optical properties of the Fe-doped BaTiO₃ films were analyzed by Z-scan method. Nonlinear optical responses of the BaTiO₃ films were enhanced by Fe doping. For BaTi_{0.96}Fe_{0.04}O₃ film, the third-order nonlinear refractive index coefficient γ , the nonlinear refractive index coefficient n_2 , the nonlinear absorption coefficient β and the third-order nonlinear susceptibility $\chi^{(3)}$ are $1.98 \times 10^{-13} \text{ m}^2/\text{W}$, $1.03 \times 10^{-6} \text{ esu}$, $1.33 \times 10^{-7} \text{ m/W}$, $2.38 \times 10^{-7} \text{ esu}$ respectively. The nonlinearity is predominated by the nonlinear refractive behavior. These results suggest that Fe doping may tune the linear and nonlinear optical properties of BaTiO₃ films, which indicates that Fe-doped BaTiO₃ films are promising materials for applications in optical devices. © 2016 Elsevier B.V.

著者キーワード

BaTiO₃; Doping; Optical property; Sol-gel; Thin film

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