文献数

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Tuning optical and magnetic properties of nanocrystalline BaTiO3 films by Fe doping
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抄録 (Abstract)
Fe-doped BaTiO3 is a promising multiferroics material due to its appealing physical properties and potential applications in sensors, transducers and non-volatile memories and multilayer capacitors. Herein, Fe-doped BaTiO3 nanocrystalline films were deposited on silicon substrates by chemical solution route. The relation between Fe content and the optical and magnetic properties of the samples was analyzed. X-ray diffraction data show that the films are tetragonal with P4mm space group. The atomic force microscopy measurement indicates that the film surface roughness increases with Fe composition. The optical response behavior of the films was investigated by Adachi's dielectric function model with fitting ellipsometric spectra in the photon energy 1.5–4.13 eV. With increasing Fe content, the real part of dielectric functions gradually decreases in the transparent region. Moreover, EOBG (the optical band gap) is reduced with increasing Fe composition x, and the relationship between them is EOBG = (3.817–1.440 × x) eV. All Fe-doped films show weak ferromagnetism coming from the bound magnetic polarons and exchange interaction between oxygen vacancies and Fe3+ in the films. When iron content x exceeds 0.06, the magnetization values of the samples exhibit an unsaturated characteristic at more than 3000 Oe magnetic fields, which is due to the competition between the ferromagnetism and the antiferromagnetism of two Fe3+ ions superexchange. These results suggest that optical and magnetic properties of Fe-doped BaTiO3 nanocrystalline films can be changed by Fe composition. © 2018, Springer-Verlag GmbH Germany, part of Springer Nature.

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