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New Frontiers in Multifunctional Material Science and Processing

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Institute for Technology of Nuclear and Other Raw Mineral Materials
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Microstructure evolution and phase transition in Er doped BaTiO₃ ceramics

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The Er doped BaTiO₃ ceramics, with different Er₂O₃ content, ranging from 0.01 to 1.0 wt% Er, were investigated regarding their microstructural and dielectric characteristics in this paper. Doped BaTiO₃ were prepared by using conventional method of solid state sintering at 1380 °C for four hours. SEM analysis of Er/BaTiO₃ doped ceramics showed that in samples doped with a rare-earth ions low level, the grain size ranged from 20-40 μm, while with the higher dopant concentration the abnormal grain growth is inhibited and the grain size ranged between 2-10μm. Dielectric measurements were carried out as a function of temperature up to 180°C at different frequencies. The low doped samples sintered at 1380 °C, display the high value of dielectric permittivity at room temperature, 2160 for 0.01 Er/BaTiO₃. A nearly flat permittivity-response was obtained in specimens with higher additive content. Using a Curie-Weiss law and modified Curie-Weiss law the Curie constant C , Curie temperature T_c and a critical exponent of nonlinearity γ were calculated. The Curie temperature of doped samples were ranged from 126 to 130 °C. The Curie constant for all series of samples decrease with increase of dopant concentration and the lowest values were measured from samples doped with 0.01 wt% of additive. The obtained value of γ pointed out that the specimens have almost sharp phase transition.