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# Co-doping effects of A-site $Y^{3+}$ and B-site $Al^{3+}$ on the microstructures and dielectric properties of $CaCu_3Ti_4O_{12}$ ceramics

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## Abstract

Different doping elements have been used to reduce the dielectric losses of  $CaCu_3Ti_4O_{12}$  ceramics, but their dielectric constants usually are undesirably decreased. This work intends to reduce their dielectric losses and simultaneously enhance their dielectric constants by co-doping  $Y^{3+}$  as a donor at A site and  $Al^{3+}$  as an acceptor at B site for substituting  $Ca^{2+}$  and  $Ti^{4+}$ , respectively. Samples with different doping concentrations  $x = 0, 0.01, 0.02, 0.03, 0.05$  and  $0.07$  have been prepared. It has been shown that their dielectric losses are generally reduced and their dielectric constants are simultaneously enhanced across the frequency range up to 1 MHz. The doped sample with  $x = 0.05$  exhibits the highest dielectric constant, which is well over  $10^4$  for frequency up to 1 MHz and is about 20% higher than the undoped sample. Impedance spectra indicate that the doped samples have much higher grain boundary resistance than the undoped one.

**Keywords:**  $CaCu_3Ti_4O_{12}$ ; co-doping; dielectric property; colossal dielectric constant ceramic

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