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Effects of calcium doping on yttrium titanate for microwave absorbing applications

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Abstract

We reported on the dielectric and microwave absorbing properties of Ca-doped $Y_2Ti_2O_7$ prepared by hot-pressing sintering. The structure, thermogravimetric analysis, conductivity, dielectric and microwave absorbing properties were systematically investigated. The results indicated that the main charge compensation mechanism was oxygen vacancies at low Ca^{2+} doping concentration, while at high Ca^{2+} doping levels, oxygen vacancies and Ca interstitials coexisted in the $Y_{2-x}Ca_xTi_2O_7$. The major types of polarization process involved in this study are electronic, atomic and space charge polarization and orientational polarization. The minimum reflection loss of $Y_{1.8}Ca_{0.2}Ti_2O_7$ can reach -40.9 dB with a thickness of 1.1 mm. These properties manifest that Ca-doped $Y_2Ti_2O_7$ ceramics have the potential applications as microwave absorbing materials.

Keywords:

$Y_2Ti_2O_7$; Ca^{2+} doping; Pyrochlore; Dielectric; Microwave absorption

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