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# Enhanced permittivity and permeability of (1-y)(Mg<sub>0.95</sub>Zn<sub>0.05</sub>)<sub>2</sub>TiO<sub>4</sub>-yMg<sub>0.95</sub>Zn<sub>0.05</sub>Fe<sub>2</sub>O<sub>4</sub> ceramics

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## Abstract

We report the preparation of the solid-solutions (1-y)(Mg<sub>0.95</sub>Zn<sub>0.05</sub>)<sub>2</sub>TiO<sub>4</sub>-yMg<sub>0.95</sub>Zn<sub>0.05</sub>Fe<sub>2</sub>O<sub>4</sub> (y = 0, 0.1, 0.3, 0.5, 0.7, 0.9, 1) by traditional solid-state reaction and systematically study their phases, morphologies, and magnetodielectric properties. The giant dielectric constants are observed at low frequency in the ceramics, with y > 0.5 when the sintering temperature exceeds 1200 °C. The highest relative permittivity  $\epsilon'$  of  $9.98 \times 10^3$  at 30 kHz and the largest squareness ratio of 0.89 for the magnetic hysteresis loop are achieved in 0.1MZT-0.9MZF. In addition, the enhanced initial permeability  $\mu_i$  of  $\sim 70$  is obtained in 0.3MZT-0.7MZF due to its large grain size and probably the smaller magnetostriction and internal stress caused by lower relative density. All the results indicate that our solid-solutions with y > 0.5 can considerably improve the dielectric and magnetic properties, providing more advantages than the simple bi-phasic compounds in the applications for novel electronic devices.

Keywords: Spinel; Ferrite; Solid-solutions; Giant dielectric constant; Permeability

## 1. Introduction

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