Title: Enhanced permittivity and permeability of $(1\text{-}y)(Mg_{0.95}Zn_{0.05})_2TiO_4\text{-}yMg_{0.95}Zn_{0.05}Fe_2O_4$ ceramics

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PII: S0955-2219(18)30486-2
DOI: https://doi.org/10.1016/j.jeurceramsoc.2018.07.055
Reference: JECS 12023

To appear in: *Journal of the European Ceramic Society*

Received date: 2-5-2018
Revised date: 30-7-2018
Accepted date: 31-7-2018

Please cite this article as: Ma R, Cheng Y, Liu W, Wu L, Yuan Q, Zhang H, Fang H, Wang J, Wang H, Enhanced permittivity and permeability of $(1\text{-}y)(Mg_{0.95}Zn_{0.05})_2TiO_4\text{-}yMg_{0.95}Zn_{0.05}Fe_2O_4$ ceramics, *Journal of the European Ceramic Society* (2018), https://doi.org/10.1016/j.jeurceramsoc.2018.07.055

Enhanced permittivity and permeability of (1-*y*)($Mg_{0.95}Zn_{0.05}$)$_2TiO_4$-*y*$Mg_{0.95}Zn_{0.05}Fe_2O_4$ ceramics

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Abstract

We report the preparation of the solid-solutions (1-*y*)($Mg_{0.95}Zn_{0.05}$)$_2TiO_4$-*y*$Mg_{0.95}Zn_{0.05}Fe_2O_4$ (*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 ℃. The highest relative permittivity ε' of 9.98×10^3 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 μ_i of ~ 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