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Effect of sintering temperature on the microstructure and electrical properties of porous BS-0.64PT piezoceramics

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Porous BiScO3-0.64PbTiO3 (BS-0.64PT) ceramics were fabricated by using burnable plastic sphere technique (BURPS). The volume fraction of poly methyl methacrylate microsphere (PMMA) was changed from 10 vol% to 50 vol% for higher porosity. As sintering temperature increased from 1000°C to 1150°C, average grain size of porous BS-0.64PT ceramics with different volume fraction of PMMA increased evidently from 1.02 μm to 9.0 μm, while pore shape was nearly sphere with no obvious difference in pore size. Relative permittivity (Ɛr) increased slightly with increasing sintering temperature. Piezoelectric coefficient (d_{33}) of porous ceramics with 10~30 vol%PMMA sintered at 1100°C was about 430 pC/N, which was higher than that of sintered at 1000°C, 1050°C, 1150°C. When the PMMA content was 40~50 vol%, d_{33} decreased gradually with increasing sintering temperature. Electromechanical coupling coefficients (κ_p, κ_t), mechanical quality factor (Q_m), piezoelectric coefficient (d_{31}), hydrostatic voltage coefficient (g_h), hydrostatic figure of merit (HFOM) were derived from impedance spectrum. The result demonstrated that the value of g_h and HFOM for porous BS-0.64PT ceramics sintered at 1000°C and 1100°C were higher than that sintered at 1050°C and 1150°C. The highest gh and HFOM were 0.025 V/m•Pa and 5867×10^{-15}/Pa respectively, with 30 vol% PMMA and porosity of 21.6% sintered at 1100 °C.

Biography

Jinting Tan is currently pursuing her Doctoral degree at Xi'an Jiaotong University. She has published more than 12 papers in reputed journals, such as Ceramics International and Journal of Materails Science.

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