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Synthesis and Microwave Dielectric Properties of Double Perovskite Ceramics $\mathbf{Ba_2Zn_{1-x}Ca_xWO_6}$

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Abstract—*Recently the use of microwave dielectric ceramic materials have been proposed for controlling various properties of materials such as relative permittivity, dielectric loss and temperature coefficient of resonant frequency [1].Double perovskite* $Ba_2Zn_{1-x}Ca_xWO_6(x = 0 - 0.4)$*are well known ceramics of current interest [2]. The samples were prepared by a conventional solid state reaction route. High purity* $BaCO_3$*,* ZnO*,* $CaCO_3$ *and* WO_3 *were used as raw materials. The compounds were weighed according to the stoichiometric ratio, grinded & calcined at 1100°C for 4 hours in alumina crucible. The obtained calcined powders were mixed with polyvinyl alcohol & pressed into pellets of 10 mm diameter & 4.5 mm thickness under a pressure of 1000 kg/cm*^{2}*. The structural, vibrational and microwave dielectric properties of double perovskite ceramics* $Ba_2Zn_{1-x}Ca_xWO_6$ $(x = 0 - 0.4)$*were investigated. The samples were sintered at different temperatures in the range 1300−1400 °C for 4 h. The grown samples were characterized by means of X−ray diffraction, Raman spectroscopy, scanning electron microscopy and energy dispersive X−ray spectroscopy analysis. Microwave dielectric properties of the samples were measured using the* $TE_{01\delta}$*resonance mode of the cylindrical pellets. The relative permittivity*(ε_r)*, calculated using Clausius−Mossotti equation is found to be comparable with the experimental results. Our analysis shows that the tolerance factor* (t) *as well as the temperature coefficient of resonant frequency* (τ_f)*of these perovskites decreases with the increase in Ca content. The value of* τ_f *is zero for the samples with* $x = 0.3$ *and 0.4.*

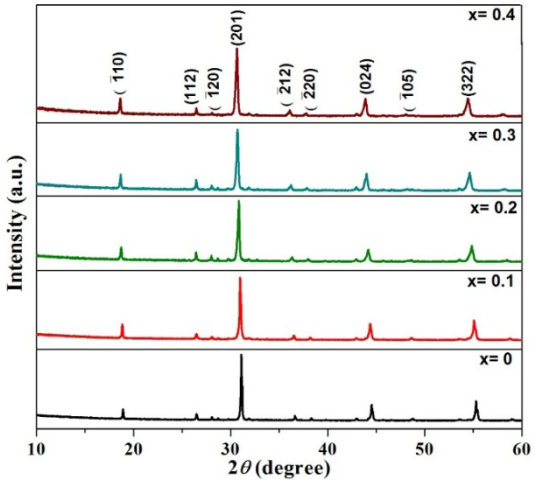

Fig. 1: XRD pattern of $Ba_2Zn_{1-x}Ca_xWO_6$ceramics$(x = 0 - 0.4)$, sintered at 1400 °C.

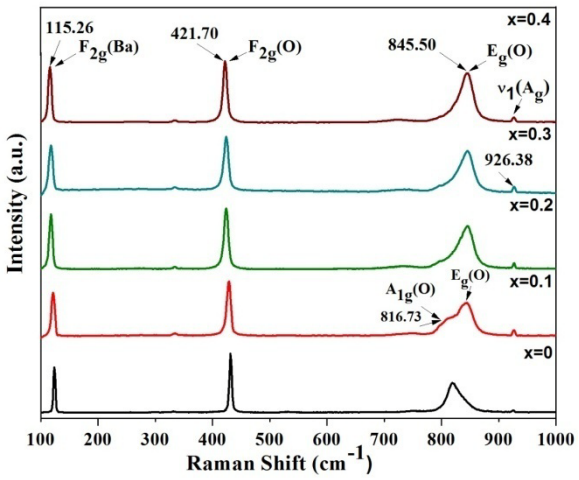

Fig. 2: Raman Spectra of $Ba_2Zn_{1-x}Ca_xWO_6$ceramics$(x = 0 - 0.4)$, sintered at 1400 °C.

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