World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:9, No:12, 2015

A Comparative Study of Substituted Li Ferrites Sintered by the Conventional and Microwave Sintering Technique

Authors : Ibetombi Soibam

Abstract : Li-Zn-Ni ferrite having the compositional formula Li0.4-0.5xZn0.2NixFe2.4-0.5xO4 where x = 0.02 ≤ x ≤0.1 in steps of 0.02 was fabricated by the citrate precursor method. In this method, metal nitrates and citric acid was used to prepare the gel which exhibit self-propagating combustion behavior giving the required ferrite sample. The ferrite sample was given a pre-firing at 650°C in a programmable conventional furnace for 3 hours with a heating rate of 5°C/min. A series of the sample was finally given conventional sintering (CS) at 1040°C after the pre-firing process. Another series was given microwave sintering (MS) at 1040°C in a programmable microwave furnace which uses a single magnetron operating at 2.45 GHz frequency. X- ray diffraction pattern confirmed the spinel phase structure for both the series. The theoretical and experimental density was calculated. It was observed that densification increases with the increase in Ni concentration in both the series. However, samples sintered by microwave technique was found to be denser. The microstructure of the two series of the sample was examined using scanning electron microscopy (SEM). Dielectric properties have been investigated as a function of frequency and composition for both series of samples sintered by CS and MS technique. The variation of dielectric constant with frequency show dispersion for both the series. It was explained in terms of Koop's two layer model. From the analysis of dielectric measurement, it was observed that the value of room temperature dielectric constant decreases with the increase in Ni concentration for both the series. The microwave sintered samples show a lower dielectric constant making microwave sintering suitable for high-frequency applications. The possible mechanisms contributing to all the above behavior is being discussed.

Keywords : citrate precursor, dielectric constant, ferrites, microwave sintering
Conference Title : ICCMMP 2015 : International Conference on Condensed Matter and Materials Physics
Conference Location : Bangkok, Thailand
Conference Dates : December 17-18, 2015