Impedance Spectroscopy Analysis of $Sr_3V_2O_8$ Ceramic matrix with Different additions of Bi_2O_3 for Radio Frequency Applications

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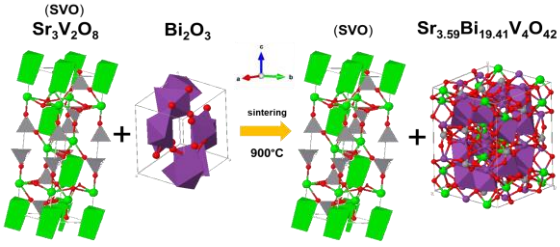
The aim of this paper is to present the behavior of the structural and dielectric properties of the ceramic matrix of $Sr_3V_2O_8$ (SVO) with addition of bismuth oxides (SVON, N = 0, 10, 20,30 and 40% in weight of Bi_2O_3). Great attention has been paid to $Sr_3V_2O_8$ ceramic due to higher structural stability and excellent dielectric properties usefully for applications in microwave devices [1]. The phase pura SVO been obtained by conventional solid-state reaction method and calcined at 950°C.The SVON ceramic composites were analyzed by means X-ray powder diffraction and complex impedance methods using impedance spectroscopy (IS) on a wide range of frequency (1 Hz - 1 MHz) and temperature (25°C - 460°C). In measurements carried out at room temperature at 27°C, we obtained high dielectric constant values (ε') with low loss values (tan δ) in radiofrequency measurements of high-frequency 1 MHz; for example, in the SVO and SVO40 samples, where consecutive values of dielectric constants and losses of $\varepsilon' = 112$, $\tan\delta = 10^{-2}$ and $\varepsilon' = 75$, $\tan\delta = 6 \times 10^{-3}$ were reached. High dielectric constant values around 730 to 1300 at various temperatures were also obtained at 1 kHz and on the low-frequency region [2]. The study revealed that SVON compounds have giant dielectric constants at various temperatures. Temperature capacitance coefficient (TCC) measurements showed that thermal capacitive stability can be achieved, within 1MHz, by increasing the Bi_2O_3 addition level up to TCC ~ 0ppm/°C. With SVO we obtained a TCC = -0.55 ppm/°C which doped with 40% Bi_2O_3 rose to TCC = -0.053 ppm/°C. In this study we obtained a SVON ceramic useful for the development of ceramic capacitors, NTC thermistors and radiofrequency devices like equivalent electrical circuits (R-CPE).

Figure 1 – Crystal structure of the SVON ceramic composites.



References

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