

Cu₂O addition and sintering temperature dependence of structural, microstructural and dielectric properties of CaCu₃Ti₄O₁₂ ceramics

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Abstract: This study is aimed in the replacement of commonly used (CuO) by Cu₂O in the synthesis of perovskite CaCu₃Ti₄O₁₂ (CCTO) phase by the solid-state reaction method. The XRD analysis of powder calcined at 1100 °C and ceramics sintered at different temperatures show that the CCTO phase was well crystallized with the presence of small quantities of additional phases. The SEM/EDS analysis of prepared pellets show that the formation of Cu₂O/CuO phase occurs above 950 °C, resulting in enhanced densification at 1050 °C (>96%). However, it is found that the Cu₂O-based CCTO begins to degrade around 1090 °C. The densification after sintering at 1050 °C reaches 96%, meanwhile dielectric constant and loss tangent values are optimum in the low frequency range (<10³ Hz); i.e. 13378 and 0.177, respectively. This favors the use of Cu₂O instead of CuO in CCTO ceramics for applications at low frequencies.

Keywords : Ceramics, CCTO, powder metallurgy, XRD and SEM, Dielectric properties