

Development of dielectric material with ceramic matrix composite (CMC) produced from kaolinite and CaCu₃Ti₄O₁₂ (CCTO)

ABSTRACT

Ceramic matrix composites (CMC) combine reinforcing ceramic phases, CaCu₃Ti₄O₁₂ (CCTO) with a ceramic matrix, kaolinite to create materials with new and superior properties. 10% and 20% CCTO were prepared by using a conventional solid state reaction method. CMC samples were pre-sintered at 800 °C and sintered at 1000 °C. The dielectric properties of samples were measured using HP 4192A LF Impedance Analyzer. Microstructures of the samples were observed using an optical microscope. XRD was used to determine the crystalline structure of the samples. The AFM showed the morphology of the samples. The results showed that the dielectric constant and dielectric loss factor of both samples are frequency dependent. At 10 Hz, the dielectric constant is 1011 for both samples. The CMC samples were independent with temperature with low dielectric constant in the frequency range of 10⁴ to 10⁶ Hz. Since the CMC samples consist of different amount of kaolinite, so each sample exhibit different defect mechanism. Different reaction may occur for different composition of material. The effects of processing conditions on the microstructure and electrical properties of CMC are also discussed.

Keyword: CCTO; Dielectric properties; Kaolinite