

Effects of Cu and Ti excess on the dielectric properties of CaCu₃Ti₄O₁₂ prepared using a wet chemical method

Abstract

The effects of Cu excess on the dielectric properties of CaCu₃Ti₄O₁₂ were studied in this paper. The CaCu₃Ti₄O₁₂ was synthesized starting from a solution of TiO₂ sol to which appropriate amounts of Ca and Cu nitrates were added. Due to the differences in solubilities of the constituents, variations from ideal stoichiometry and a high solution pH was necessary in order to obtain final stoichiometric precipitates. Excess CuO, observed in the SEM as a separate phase surrounding the CaCu₃Ti₄O₁₂ grains, were obtained by varying the parameters. Samples with a high CuO excess content showed lower dielectric constants (<10 000), compared to samples with very low CuO content (~50 000). The higher dielectric constant of nearly pure CaCu₃Ti₄O₁₂ samples could not be attributed to the volumetric content alone which implies an extrinsic factor such as the distribution of Cu rich phase at the grain boundaries.

Keywords — Ceramics, ferroelectrics, microstructure, precipitation