

Synthesis & Application of High dielectric constant Material: $\text{CaCu}_3\text{Ti}_4\text{O}_{12}$ (CCTO)

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ABSTRACT

Today a lot of advancement is taking place in electronics industry. This advancement is concomitant with the creation of new materials with high permittivity (called high dielectric constant (k) materials). A higher k material is desired to store more electric energy than the one with a lower value. As a result, its use in electronic devices reduces the size of the components and improves their efficiency also. As Capacitor is one of the most important components of electronic devices, a lot of research is going on to reduce its size. Traditional BaTiO_3 based ferroelectric materials exhibit high dielectric constant. But there is a problem with these materials the strong temperature dependence of their dielectric constant near Ferro to Para electric transition. In this context, $\text{CaCu}_3\text{Ti}_4\text{O}_{12}$ (CCTO) is attracting increasing scientific and technological interest because of its giant dielectric constant. Hence it has potential application in capacitor based devices.

In the present work, solid state conventional technique was adopted for the synthesis of CCTO, using CuSO_4 , TiO_2 , and CaCO_3 as starting materials. X-ray diffraction patterns were recorded to study the crystal structure by using X-ray diffractometer employing Cu-K α radiation with a Ni-filter. Phase stabilization is examined by employing DSC/TGA technique. It is observed that the resulted compounds are formed in single phase with cubic crystal system. Detailed investigations will be presented in the full paper.

Key words: Dielectric constant; synthesis; XRD; TGA; $\text{CaCu}_3\text{Ti}_4\text{O}_{12}$

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