

Systematic microstructural development with thermal diffusivity behaviour from nanometric to micronic grains of strontium titanate

ABSTRACT

Strontium titanate is a promising candidate for applications in thermoelectric, thermal management applications, and modern electronic devices because of its desirable thermal stability, chemical stability, and semiconducting behaviour. However, the absence of its important systematic development, having grain size from several nanometric up to micronic size with evolving thermal diffusivity behaviour, triggers the need for filling up the vacuum. Two different heat treatments have been carried out onto the samples which were with presintering and without presintering. Nanometer-sized compacted powder samples were sintered from 500 to 1400 °C using 100 °C increments. The parallel characterizations of structural, microstructural and thermal diffusivity properties were systematically carried out. Interestingly, three significant value-differentiated groups: weak, moderate, and strong thermal diffusivity were observed, resulting from the influence of different phonon-scattering mechanisms through a systematic development of microstructural properties for both heat treatments.

Keyword: Thermal diffusivity; Thermal conductivity; Microstructure; Strontium titanate