Synthesis, Characterization and TL studies of Porous $CaSiO_3$ Ceramic Powders

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Abstract

Nanocrystalline porous $CaSiO_3$ ceramic powders have been synthesized by a novel low temperature initiated self-propagating, gas producing solution combustion process and characterized by XRD, SEM, EDS, porosity, surface area and Thermoluminescence (TL) studies. The effect of temperature on crystalline phase formation, amount of porogens and particle size of porous $CaSiO_3$ has been investigated. Single phase β-$CaSiO_3$ and α-$CaSiO_3$ are formed at 950 and 1200 °C respectively. The phase transformation temperatures of combustion derived $CaSiO_3$ were found to be lower compare to the powders obtained via solid state reaction method. The micro structure and morphology were studied by SEM and it is interesting to note that with increase in calcination temperature, the samples becoming more porous and the pore diameter increases from 2 to 10 μm. The samples calcined at 950 °C for 3 hours has 17.5 % porosity, however the porosity increases to 31.6 % on calcination at 1200 °C for 3 hours. The surface area of as formed and calcined at 950 and 1200 °C of $CaSiO_3$ samples were found to be 31.93 m^2/g, 0.585m^2/g and 3.48 m^2/g respectively. The TL intensity in powdered sample is more when compared to the pelletized $CaSiO_3$ and it is further observed that there is a shift in glow peak temperatures in pelletized sample. This is attributed to the inter particle spacing and pressure-induced defects.