

Effect of sintering temperatures and foaming agent content to the physical and structural properties of wollastonite based foam glass-ceramics

ABSTRACT

This study aims to fabricate low-cost foam glass-ceramic using soda-lime-silica (SLS) glass waste and clamshells (CS) as foaming agent in content between 1 and 12 wt.% by conventional powder processing method. The samples were undergoing sintering process between 700 and 1000 °C with holding time of 30 minutes and characterized according to the physical and structural properties. Samples containing 3 wt.% CS treated at 800 °C show the greatest size of porosity. As the sintering temperature increased, the samples tend to become less dense. However, for the samples sintered at 900 and 1000 °C, the trend of the density changes because of the excess CO₂ gases generated during the heat treatment process promotes an increase in internal pressure, which results in the rupture of the pore walls. For linear expansion, for samples with a sintering temperature of 800 °C and higher, the increment of the temperature will lead to the decrement of linear expansion (%). As the sintering temperature increases from 700 to 800 °C, the water absorption (%) increases. However, the percentage of water absorption decreases with the further increment of sintering temperature. The XRD characterization showed the formation of wollastonite phase (CaSiO₃) and further revealed the formation of greater peaks of CaSiO₃ at the higher sintering temperatures. The results of compressive mechanical strength between 0.15 and 1.50 MPa indicate that the obtained glass-ceramic foams have potential for building material applications.

Keyword: Foam glass-ceramic; Wollastonite; Clamshell; Glass waste; Sintering