

The Thermal Behavior of Cordierite-Based Ceramic with the Substitution of Treated Flue Gas Desulfurization Sludge in the Non-stoichiometric Cordierite Composition

Abstract

The substitution of FGD sludge that is rich with a glass-forming agent in non-stoichiometric cordierite composition is able to crystallize α -cordierite at the low sintering temperature, 1250 °C via solid-state reaction methods. Even though the substitution of MgO with FGD sludge can reduce the sintering temperature, the physical and mechanical properties of cordierite-based ceramic with FGD sludge are depleted due to the decomposition of SO₃ took place during the sintering process and thus lead to the formation of voids in the ceramic. Thus, this paper is focusing on the thermal properties of cordierite-based ceramic when subjected to a high sintering temperature, 1000 °C using a dilatometric test. Different wt% of treated FGD sludge substitution gave a different type of CTE value, but 3.0 wt% of FGD sludge is able to obtain the lowest CTE value, $2.26 \times 10^{-6}/^{\circ}\text{C}$, compared to other samples as this sample obtains a single phase of α -cordierite phases.

Keywords

Cordierite; Dilatometer; FGD sludge; Nucleating agent; Sintering aids; Substitution