

Synthesis and characterization of $x\text{MgO}\cdot 1.5\text{Al}_2\text{O}_3\cdot 5\text{SiO}_2$ ($x = 2.6\text{-}3.0$) system using mainly talc and kaolin through the glass route

Abstract

Three non-stoichiometric cordierite with compositions of $x\text{MgO}\cdot 1.5\text{Al}_2\text{O}_3\cdot 5\text{SiO}_2$ ($x = 2.6\text{-}3.0$ mol) were synthesized using mainly talc and kaolin through the glass route. The densification and crystallization behaviors of these glass powders were investigated using DTA, dilatometer, and XRD. Samples were then heat treated at 900 °C for 2 h and further analyzed using XRD, CTE, FESEM, density and porosity tests, and also dielectric test to further investigate their properties. The $2.8\text{MgO}\cdot 1.5\text{Al}_2\text{O}_3\cdot 5\text{SiO}_2$ glass composition fully densified and crystallized into high purity α -cordierite at the heat treatment temperature. It exhibited lower CTE and dielectric constant compared to other composition, making it suitable for high frequency applications. Other formulations which contain multi crystalline phases require much higher temperatures for densification. The CTE value depends on the type of crystalline phase which exist in the sample, while the dielectric constant decreased with increasing MgO amounts in the sample compositions.