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Cordierite obtained from compositions containing kaolin waste, talc and magnesium oxide

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Abstract

The purpose of this study was to obtain cordierite from compositions containing kaolin waste (with different particle-size distributions), talc and magnesium oxide, for use in the production of refractory and insulating materials. The samples were characterized by means of the following techniques: chemical analysis by X-ray fluorescence, X-ray diffraction, particle size analysis and thermogravimetric and differential thermal analysis. The microstructure of the samples was analyzed using scanning electron microscopy. Rectangular test specimens (50mm x 15mm x 5 mm) were prepared by uniaxial pressing (13.0 MPa), dried at 110°C/24h and sintered at temperatures of 950, 1050, 1150, 1250 and 1350°C. The mineralogical analysis revealed the beginning of the formation of characteristic peaks of cordierite phase at 1250°C, and more intense peaks were identified at 1350°C. The morphological analysis revealed rose-like and hexagonal tube-like crystals.

Keywords: A. Sintering; D. Cordierite; D. kaolin waste; D. talc; D. Magnesium oxide

1. Introduction

Cordierite is an aluminum magnesium silicate that can be represented in a ternary system, containing magnesium oxide (MgO), aluminum oxide (Al₂O₃) and silicon oxide (SiO₂) in the proportions 2:2:5, respectively, with density of 2.53g/cm³ and melting temperature of 1470°C [1,2]. This mineral has a low thermal expansion coefficient ($\alpha = (1-3) \times 10^{-6} \text{ }^\circ\text{C}^{-1}$), high thermal shock resistance, low dielectric constant, high resistivity ($\rho > 10^{12} \text{ } \Omega \text{ cm}$), high chemical and thermal stability, high refractoriness and high mechanical strength [3-9].

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