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Vitrification of blast furnace slag and fluorite tailings for giving diopside-fluorapatite glass-ceramics

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Abstract

The feasibility of the preparation of diopside-fluorapatite based glass-ceramics from blast furnace slag and fluorite tailings was investigated. The results showed that the crystallization of parent glass was strongly dependent on its initial composition of raw materials. With low content of fluorite tailings, the only crystallization product was fluorapatite ($\text{Ca}_5(\text{PO}_4)_3\text{F}$). Further increase of fluorite tailings will bring the enhancement of crystallization, resulting in the formation of diopside phase ($\text{Ca}(\text{Mg},\text{Al})(\text{Si},\text{Al})_2\text{O}_6$). The diopside-fluorapatite based glass-ceramics with Vickers hardness of 7.36 Gpa could be obtained from raw materials with a composition of 40 mass% blast furnace slag and 60 mass% fluorite tailings.

Keywords: Glass-ceramics; blast furnace slag; fluorite tailings; diopside-fluorapatite; Crystallization

1 Introduction

Blast furnace slag (BFS) is a major by-product generated during pig iron production. The conversion of BFS into glass-ceramics has dual advantages of the minimization of waste and economical interest [1-4]. Quartz sand, clay [2], kaolin [3] and pure silica [4] were chosen as proper supplements for BFS during the glass-ceramics preparation due to their relatively higher

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