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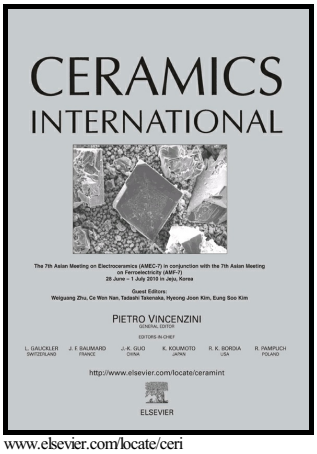

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Separation and characterisation of fused alumina obtained from aluminium-chromium slag

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Abstract

Aluminium-chromium slag is a by-product of the thermal reduction of aluminium during chromium smelting, which is generally considered solid waste with a low utilisation rate. In this work, a fused carbonisation reduction method has been proposed to separate the Al_2O_3 and Cr_2O_3 from the slag and produce fused alumina and chromium carbide materials for refractory applications. The thermodynamic parameters of this process were determined using a standard thermal analysis method. In the molten slag, Cr_2O_3 reacts with C to produce high-density chromium carbide, which effectively precipitates at the bottom of the reaction vessel, while Al_2O_3 is converted into the corundum phase during cooling. The results of chemical analysis showed that the Al_2O_3 content in fused alumina was greater than 95 wt.%, while its main crystalline phase was the corundum with a bulk density of 3.57 $g \cdot cm^{-3}$, thermal conductivity of 6.4–7.4 $W \cdot m^{-1} \cdot K^{-1}$ (at temperatures above 600 °C), and average thermal expansion coefficient of about 7.5–8.2×10^{-6}/°C (in the temperature range of 800–1300 °C).

Keywords: aluminium-chromium slag; fused alumina; thermodynamic properties; fused carbonisation reduction

1. Introduction