

Effect of reclaimed bauxite on andalusite-based refractory castables for tundish applications

Abstract

The robust nature of alumina refractory materials presents opportunities for their in-process recyclability and re-use in non-critical applications. Virgin refractories can be substituted with reclaimed materials in different quantities without compromising the quality of the refractory products. In this study, the effect of reclaimed bauxite on andalusite-containing refractory castables for tundish applications was investigated. The recycled bauxite was formulated in different proportions to replace virgin andalusite in the castables. Standard tests were conducted to evaluate the physical, physicochemical and thermochemical properties of the formulated products. Static corrosion tests were further conducted using the tundish slag in order to simulate the actual conditions of operation in the tundish. The results show that the standard flow behaviour, open porosity and bulk density of samples containing up to 22 mass% reclaimed bauxite were comparable to those of the reference castable. However, high-temperature properties such as static corrosion at 1400°C and hot modulus of rupture at 1500°C indicated that there is an upper constraint to the amount of substitution. The study demonstrated direct potential savings of up to 10 % when the reclaimed alumina replacement ratio was increased to 22 mass %.