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Effects of alumina bubble addition on the properties of mullite castables

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Abstract: Injecting lance is a key equipment for hot metal pretreatment. In this work, the lance castables with high mechanical properties and thermal shock resistance were obtained by adding alumina bubbles, due to its spherical shape and hollow structure. It is found that the addition of alumina bubble improves the flow values of castables. The bulk density values of samples with the addition of 4wt% alumina bubbles (AB4) were the best of all the experimental castables. Alumina bubble addition is effective in heightening the thermal expansion, thermal conductivity of mullite castables and can resist the sharp decrease in thermal expansion above 1300°C. The addition of alumina bubble can improve the mechanical strength of mullite castables. After heating at 1400 °C, a strong chemical bond forms between the bubbles and the binding phases. Due to the appropriate bonding at the alumina bubble/matrix interface, AB4 castable exhibits a relatively better thermal shock resistance.

Keywords: Mullite castable; Alumina bubble; Mechanical properties; Thermal shock resistance

1. Introduction

Injecting lance is a key equipment of hot metal pretreatment for injecting powder into pig iron^[1-2]. The service environment of injecting lance is shown in Fig. 1. As

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