Influence of maximum temperature, holding time and cooling rate on the reducibility of iron ore sinter analogues

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ABSTRACT

During iron ore sintering the green granulated sinter bed undergoes significant changes in its structure and mineralogy due to the formation of liquid in the flame front. These changes influence the sinter reducibility, which is an important parameter influencing the productivity and fuel efficiency of the blast furnace. Bulk measurement of sinter product from sinter pots and sinter strands reflect the average conditions experienced by the sinter. Significant variation in the temperature profile, pO_2 and local chemistry occur due to the heterogeneity of the green bed and the change in the flame front width as it descends through the bed. To understand the mechanisms of structure and mineralogy change and its effect on quality, lower variability iron ore sinter analogues were created. Iron ore sinter analogues were created from fine iron ore (<1mm) and laboratory chemical reagents and fluxed to a basicity of 2.0. These analogues were then fired with tightly controlled temperature profile and atmosphere in an infra-red rapid heating furnace. The analogues structure was measured using both mercury intrusion porosimetry and optical microscopy. This paper discusses the effect of maximum temperature, holding time and cooling rate on the development of the structure and mineralogy of analogues sinters and their relationship with reducibility.

KEY WORDS

Reducibility, porosity, mineralogy, sinter analogues