Influence of the magnetite concentrate properties on sintering performance of magnetite-hematite-goethite iron ore blends and sinter quality

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ABSTRACT

The proportion of fine magnetite concentrates in iron ore blends is expected to grow in future due to decreasing availability of high-grade iron ore resources and increasing utilization of the low-grades. Different magnetite concentrates were usually found to possess distinct physicochemical properties, which will largely affect the sintering performance of iron ore blends and consequently the quality of sinter products. In this work, two typical magnetite concentrates (low-Si MC-1# and high-Si MC-2#) from China and Australia, respectively, were compared through mini-pot ($\Phi 100 \times 500$ mm) sintering tests in terms of their effects on the sintering performance of magnetite-hematite-goethite iron ore blends and the quality of sinters. The effect of magnetite concentrates properties including chemical compositions, particle size distribution and oxidizability were investigated and further discussed in association with the metallurgical properties of sinters and formation characteristics of liquid phase at high temperature zone in sinter bed. The results show the substitution of MC-2# for MC-1# in iron ore blend generally results in deterioration of both sinter strength and metallurgical performance. The mineralogical study of sinters reveals that the addition of high-Si MC-2# tends to promote formation of high-Si sinter melt and low-strength sinter matrix, which can be attributed to its higher SiO_2 content and inferior oxidizability compared with MC-1#. Since the high-Si magnetite concentrate are more likely to act as adhering particles and lead to formation of low-strength sinter matrix during sintering process, it is recommended to use this ore type after pre-grounding and beneficiation for reducing its SiO_2 content or as pellet feed.