Comparison of the Mineralogy of Iron Ore Sinters Using a Range of Techniques

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ABSTRACT

Many different approaches have been used in the past to characterise iron ore sinter mineralogy to predict sinter quality and elucidate the impacts of iron ore characteristics and process variables on the mechanisms of sintering. This paper compares the mineralogy of three sinter samples with basicities between 1.6 and 2.0. The measurement techniques used were optical image analysis and point counting, quantitative X-ray diffraction (QXRD) and two different scanning electron microscopy systems - QEMSCAN and TIMA. Each technique has its advantages and disadvantages depending on the objectives of the measurement, with the quantification of crystalline phases, textural relationship between minerals, and chemical composition of phases covered by the combined results. Some key differences were found between QXRD and the microscopy techniques. QXRD results imply that not all of the silicoferrite of calcium and aluminium (SFCA-I) is being identified on the basis of morphology in the microscopy results. The amorphous content determined by XRD is higher than the glass content identified in the microscopy results, while the magnetite content was lower. The scanning electron microscopy techniques were able to provide chemical analysis of the phases, however, the thresholding of hematite and magnetite can be problematic, and exact correspondence with textural types is not always possible. The results from the various techniques are compared and the relationships between the measurement results are discussed.