

Investigations on quantitative X - ray diffraction of iron ores using the Rietveld method

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Brazil is one of the major producing countries of iron ores. Hematite, goethite and magnetite are the main Fe - bearing minerals in iron ores. For characterising all existing phases simultaneously, without time intensive investigation and with low personal and equipment effort, quantitative Rietveld analysis is an exact and reliable method. After preparation, measurement and calculation can be made almost completely automatically.

A first quantification should be realised on mixtures with 4 phases: hematite, magnetite, goethite and quartz. For analysing different characteristics on different varieties of hematite (lamellae, radial and massive aggregates) the samples were taken from various iron ore deposits (Itabira (Brazil), Arkansas (USA), Elba (Italy) and Cumberland (England)).

A model developed on known mixtures of the phases should be applied to natural iron ores. Special attention had to be paid on the texture effects on the X-ray diagram resulting from the different hematite varieties. The reasons for this effects are not only the raw materials, but also the various grinding methods (planing milling, slicing milling, mortar milling), grinding times, varying preparation methods (front loading, side loading, back loading) and effects caused by microabsorption. All these factors have consequences for the intensities of the single peaks on the X-ray diagram and also influence each other.

Results from a quantification of mixtures with hematite from Itabira (Brazil) with increased texture problems can be analysed with an absolute error of 2%.