The influence of gangue minerals on the composition and mineralogy of magnetite in high-grade metamorphic iron ore deposits: Implications for the Warramboo deposit.

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THE INFLUENCE OF GANGUE MINERALS ON THE COMPOSITION AND MINERALOGY OF MAGNETITE IN HIGH-GRADE METAMORPHIC IRON ORE DEPOSITS: IMPLICATIONS FOR THE WARRAMBOO DEPOSIT.

ABSTRACT

Understanding the influence that gangue minerals have on the composition and mineralogy of magnetite in high-grade metamorphic deposits is important for the sustainability of iron ore production in Australia. LA-ICP-MS and electron microprobe data from the granulite-facies Warramboo magnetite gneiss and the greenschist-facies Price Metasediments of the southeast Gawler Craton are used to investigate trace element partitioning between the oxide and gangue minerals, with a particular focus on the manganese content of garnet and magnetite. The data indicates that magnetite formed prior to garnet resulting in the partitioning of manganese and iron into magnetite, and consequently restricting these elements from garnet. However, during the development of garnet coronas on magnetite, manganese is redistributed into garnet leaving magnetite comparatively depleted in manganese. The partitioning of manganese during the growth of garnet coronas does not affect the iron content, or impact the ore grade, of the magnetite. Additionally, the proportion of garnet in the Warramboo magnetite gneiss and the Price Metasediments does not correlate with manganese content. The collection of HyLogger spectroscopic data to determine proportion and composition of garnet in the Warramboo gneiss was proven to be an ineffective technique. The HyLogger scanner did not correctly identify the mineral proportions in the samples, nor identify the presence of oxide minerals. By comparing the equivalent lower grade Price Metasediments to the Warramboo gneiss it was confirmed that the enrichment of magnetite through metamorphism did not remove impurities in the form of trace elements from the mineralogy. The results presented here will benefit industry to better understand high-grade magnetite deposits and the effect gangue minerals have on the grade of iron ore deposits.

KEYWORDS

Iron ore, Trace elements, Gawler Craton, LA-ICP-MS, HyLogger, high-grade metamorphism.

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