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**Enhanced hematite recovery within fine particle size distribution in wet magnetic separation**

*Z Rezaee1, W Skinner2, and G Abaka-Wood 3*

1. PhD Student, University of South Australia, Adelaide 5095.

Email: rezzy005@mymail.unisa.edu.au

1. Research Professor,ARC Centre of Excellence for Enabling Eco-Efficient Beneficiation of Minerals, Future Industries Institute, University of South Australia, Mawson Lakes 5095.

Email: william.skinner@unisa.edu.au

1. Research Fellow, ARC Centre of Excellence for Enabling Eco-Efficient Beneficiation of Minerals, Future Industries Institute, University of South Australia, Mawson Lakes 5095.

Email: george.abaka-wood@unisa.edu.au

# ABSTRACT

Magnetic separation has long been used in mineral processing and finds major applications in the beneficiation of iron ores. In most iron ore beneficiation processes, low intensity wet magnetic separation (LIWMS) is not very effective for particles finer than 50 µm. Hence, fine magnetic particles which are usually not recovered during the LIWMS process report along with non-magnetic particles as iron ore tailings. Over the years, large volume of iron ore tailings has been generated with their associated challenges. Recycling of such tailings has become important, although a significant knowledge gap exists in developing cost-effective methods for recovering their iron content . As part of an ongoing investigation to develop methods for recovering iron oxides from existing tailings and low-grade ores, a model minerals study (involving hematite and quartz) was conducted to ascertain the relative effects of ore particle size and applied magnetic field intensity on the recovery of iron oxides. A wet high-intensity magnetic separator (WHIMS) was used in a series of tests at selected magnetic field intensities for model minerals mixture of varying particle sizes (-75 +38, -38 +20, and -20 µm) to produce a hematite rich concentrate. Specifically, the relative effects of applied magnetic force to hydrodynamic and gravitational forces on the grade and recovery of -20 µm particles were investigated. The findings demonstrate that wet magnetic separation may be used to concentrate hematite minerals from iron oxides tailings or low-grade iron oxide ores where complete liberation of the constituent minerals has been achieved. Results also suggest a higher recovery of fine hematite particles when the competitive forces (hydrodynamic and gravitational) are introduced more efficiently.

# KEY WORDS

Keywords: Magnetic separation, iron ores, hematite, quartz, wet high intensity magnetic separator (WHIMS)

# BIOGRAPHY

**Zahra Rezaee** is a PhD candidate at the University of South Australia. Her research focuses on magnetic separation of paramagnetic minerals, with a particular interest in the dry magnetic separation of iron ores and tailings. To enhance the applicability of magnetic separation, she has extensively studied key factors influencing the grade and recovery of minerals under both wet and dry conditions. She is also working on modifying a wet magnetic separator to operate without water while maintaining comparable performance. Additionally, she is also exploring the feasibility of recovering rare earth element minerals using magnetic separation and is preparing her first review paper on this topic.

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