

EXPLORATORY STUDIES ON BENEFICIATION OF LOW-GRADE BANDED IRON ORE FORMATIONS (BIF) OF KARNATAKA, INDIA

Ajita Kumari*, N. Vasumathi, P. Abhishek, T.V. Vijaya Kumar

Mineral Processing Division, CSIR-National Metallurgical Laboratory Madras Centre, Chennai, India

*Corresponding author E-mail ID: akajitakumari@gmail.com

1. INTRODUCTION

Iron ore is the basic raw material for production of metallic iron. With depletion of high-grade resources and fine dissemination of valuable minerals in the abundantly available low-grade banded iron ore formations (BIF), liberation is achieved at finer sizes. Changes in the composition of ore content and association of the minerals demand change in the processing approaches [1,2]. Hence, it necessitated all beneficiation techniques to be operated at this finer size. However, physical separation techniques have limitations in separation efficiency. A combination of pre-concentration technique such as magnetic separation followed by flotation of magnetic fraction proved to be promising in achieving the respectable grade. A low-grade iron ore sample (BIF) of Karnataka, India was subjected to high intensity magnetic separation followed by flotation for enhancing its grade and recovery. Laboratory scale studies on this ore assaying 39.80 Fe%, 39.62 SiO₂% and 1.73 Al₂O₃% indicated that it could be improved to 63.78 Fe%, 3.10 SiO₂% and 1.01 Al₂O₃% at an overall iron recovery of 24% only. However, attempts are being made to further improve the iron recovery.

2. EXPERIMENTAL

Lean-grade banded hematite quartzite (BHQ) iron ore was collected from Karnataka area of India. The feed size fractions used in the present study are +4.75 mm, -4.75+3.35 mm, -3.35+1.7 mm, -1.7+0.5 mm and -0.5 mm. Riffing and coning-quartering methods were used to draw representative samples of each size fraction for mineralogical distribution analysis. Chemical assay determined using wet chemical analysis shows that the feed sample consists of 39.80% Fe, 39.62% SiO₂, 1.73% Al₂O₃ and 1.11% LOI.

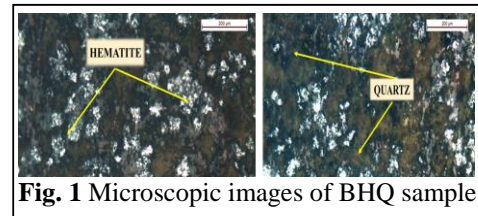


Fig. 1 Microscopic images of BHQ sample

3. RESULTS & DISCUSSIONS

The sample was subjected to wet high intensity magnetic separator (WHIMS, Ampere = 900 A & Tesla = 4000 gauss) and resultant products were collected separately. Magnetic fraction was taken for flotation studies to study the increment in valuable minerals. Results have been tabulated in Table 1.

Table 1 WHIMS results

Feed size	Concentrate (Mag.)				Tailings (Non-mag.)			
	Fe %	SiO ₂ %	Al ₂ O ₃ %	LOI %	Fe %	SiO ₂ %	Al ₂ O ₃ %	LOI %
-75 μm	49.73	25.34	1.73	1.00	11.15	76.86	3.31	2.62
-45 μm	57.98	15.08	1.01	0.55	11.37	76.8	3.05	2.66

4. CONCLUSIONS

Concentrates of higher grade and recovery could be obtained through wet high intensity magnetic separator. Further beneficiation using direct and reverse flotation studies showed improvement in grade and recovery. Using the combination of WHIMS and flotation methods, optimized concentrate assaying 63.78 Fe%, 3.10 SiO₂% and 1.01 Al₂O₃% at an overall iron recovery of 24% was obtained.

REFERENCES

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