CSIR-NML NEWSLETTER APRIL- 2021

MAY 11, 2021

CSIR-NML, JAMSHEDPUR

RESEARCH PLANNING & BUSINESS DIVISION

CSIR-National Metallurgical Laboratory
(1950-2020)

70 years of unalloyed excellence

SUMMARY OF SIGNIFICANT ACTIVITIES

For the period April,2021, CSIR-National Metallurgical Laboratory

1. Technology Development (New Product/Process Technologies)

Nil

2. Agreement(s) Signed

S.No.	Title	Client/Sponsor
1.	Agreement for Development of non-magnetic Fe-Mn biodegradable alloys for biomedical applications (Sponsored)	M/s. Surgiwear Ltd.
2.	Confidentiality Agreement	M/s. NALCO Water India Ltd.

3. Patent(s)/Copyright(s) Filed

Nil

4. S&T services that have created a national/visible impact

- **Beneficiation studies on low grade manganese ore samples**

The primary objective of the present study was to explore the possibility of developing a process flow-sheet for beneficiation of low-grade manganese ore assay with Mn 28% Mn and a reject containing The primary objective of the present study was to explore the possibility of developing a process flow-sheet for beneficiation of low-grade manganese ore assay with Mn<26% to generate a concentrate with > 28% Mn and a reject containing <10% Mn. However, one of the samples received at CSIR-NML contained 34.56% Mn which was processed for possible upgradation of Mn content. Characterization and beneficiation studies were carried out on three different low grade manganese ore samples from Manganese Ore mines of Tata Steel. The sample S1 analyzed 17.95% Mn, 30.51% Fe(T), 13.84% SiO2 and 7.18 %Al2O3, while S2 analyzed 24.18% Mn with 34.09 % Fe(T), 2.69% SiO2 and 4.93 %Al2O3 and S3 analyzed 34.58% Mn with 20.9 % Fe(T), 5.27% SiO2 and 4.97 %Al2O3 respectively. Further, from the wet size and size wise chemical analysis of the ore crushed to -50mm, it is evident that the manganese is relatively high above size 0.5mm compared to that of size below 0.5mm in all the three samples. The -45瘦 size fraction is around 20% by weight with Mn 7.5% for sample S1, whereas 10% by weight with Mn 10.36% for sample S2 and 13% by weight with Mn 13.69% for sample S3 respectively. The specific gravity of the sample S1 was 3.48 while for sample S2 & S3 it was 3.9. The

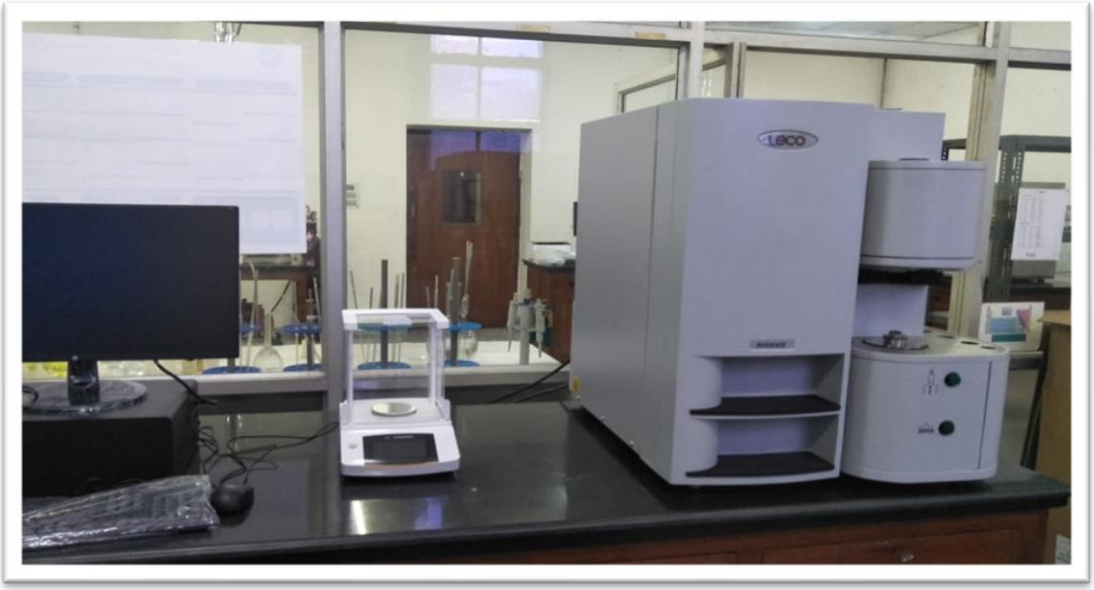
mineralogical studies suggest that the manganese ore samples are dominated with pyrolusite, goethite/limonite and manganomelane with minor amounts of cryptomelane, clay, lithiophorite and hematite. Todorokite, manganite, quartz, mica (muscovite, biotite), feldspar (orthoclase), and gibbsite are noticed in very minor to trace amounts. The major difference is due to their relative amount of goethite/limonitic and manganese bearing mineral in them. Goethite/limonite varies from 37.5-22.5% from sample S1 to S3, similarly, pyrolusite: 20-32.5%, manganomelane/psilomelane: 6-22.5%, cryptomelane: 4-6%, lithiophorite:1.5-4% from sample S1 to S3 respectively. The manganese bearing ore minerals from sample S1 to S3 varies from 33-64% while the ferruginous gangue varies from 43.5-26.5%. The interlocking of goethite with psilomelane and pyrolusite is at very fine size. Liberation is close to 30% at +1680 瘊 and enhances to only 50-60% at -105+75 瘊, which indicate a beneficiation challenge. Bench scale/large batch beneficiation studies were carried out with and without scrubbing and washing of the ore using gravity separation, magnetic separation, froth flotation and reduction-roasting.

5. Details of important Workshop(s)/Symposia(s)/Conference(s)/Training Course(s)/ Meeting(s) Organized

Nil

6. Details of any New Facilitie(s)

- **Planetary Ball Mill for Laboratory Model AI-VPB-25 Make- Amaze Instruments**
- **Hydraulic Press Semi-Automatic 50 T Hydraulic Press machine**
- **Hydrogen Determinator**



CSIR-NML had bought LECO (USA) make, Inert Gas Fusion technique based RHEN602 Hydrogen Determination. It is designed for wide-range measurement of Hydrogen content of inorganic materials, ferrous and nonferrous metals & alloys and refractory materials using the inert gas fusion technique. It is equipped with automatic cleaning system along with external PC facility for easy operation through WIN 10 base software. The equipment has facility for drift correction, blank calibration, multipoint calibration as well as gas dose calibration which makes its usable for variety of samples for wide range from PPM to % level. At CSIR-NML, it is going to be used for measurement of Hydrogen concentration in different metals & alloy base samples for various R & D projects along with development of PIN shape CRMs for Hydrogen in Steel for low & high range.

Instrument Range at 1 g sample wt.:

Hydrogen: 0.05 ppm to 250 ppm.

Precision: 0.02 ppm or 2% RSD (whichever is greater)

Detection Method: Thermal Conductivity.

Theory of Operation:

A pre-weighed sample is placed in a graphite crucible which is heated in an impulse furnace to release analyte gases. Oxygen present in the sample reacts with the graphite crucible to form CO and CO2. Nitrogen and hydrogen are extracted as N2 and H2 respectively. Argon is use as carrier gas which carry the liberated analyte gases out of the furnace. The gas then flows through Schutze reagent where the CO is oxidized to form CO2. The CO2 and any H2O present in gases is then scrubbed out of the carrier gas stream, leaving nitrogen and hydrogen. After that Nitrogen is separated from mixture of gases by a molecular sieve column. The smaller hydrogen molecule passes through the sieve more quickly than the larger nitrogen molecule, and is detected using a Thermal Conductivity (TC) detector. The nitrogen molecules are then allowed to pass through undetected. The concentration of an unknown sample is determined relative to calibration standards. To reduce interferences from instrument drift, reference measurements of pure carrier gas are made prior to each analysis.

7. Details of any outstanding Honor(s)/Award(s) received by the staff

Nil

8. Any other items considered to be significant

- **Shri. Aboni Pradhan, Laboratory Assistant superannuated from CSIR-NML on 30-04-2021.**

- **Appreciation received for their record production from M/s. KMML after adapting our Column Floatation Technology on 22nd April 2021.**

The Kerala Minerals and Metals Ltd.
(A Govt. Of Kerala Undertaking)
(An ISO 9001, ISO 14001, OHSAS 18001 & SA 8000 Certified Company)
SANKARAMANGALAM, CHAVARA-691 583
KOLLAM, KERALA, INDIA.
Phone : +91 - 476 - 2651215 to 2651217
Fax : + 91-0476-2680101, 2686721
E-mail : md@kmml.com, mdoffice@kmml.com, URL:www.kmml.com

CIN-U14109KL1972SGC002399

22nd April, 2021

The Director
CSIR - National Metallurgical Laboratory
Jamshedpur - 831 007.

Sir,

We are pleased to inform you that 3751 metric tonnes of sillimanite mineral worth around Rs. 5.63Cr. was produced from heavy mineral beach sand during the financial year 2020-21 which is a record in the KMML's history. It is also a major and significant contributor to the earnings of our Mineral Separation Plant during this period. This was made possible by adoption of 'Column Flotation Technology' developed by CSIR-NML and executed jointly by M/s. McNally Sayaji Engineering Limited (MSEL), Bengaluru. I take this opportunity to profusely thank the contribution made by the team members of CSIR-NML and M/s MSEL led by Dr. T. V. Vijaya Kumar and Mr. Murali respectively.

Thanking you,

Yours faithfully,
For Kerala Minerals & Metals Limited

Managing Director

- **Sad Demise of Staff**

Dr. R. K. Ram, Chief Medical Officer, CSIR-NML passed away on 30th April 2021.

9. Scientific & Technical Services rendered

During this period the following industrial houses viz. , received technical and scientific support from NML in the area of chemical analysis and physical test of their raw materials and finished products. During this period the following industrial houses viz. Eastern Coalfileds Limited,Burdwan , IGCAR, Kalpakam , M/s Prasanna Kumar Panigrahi, Odisha , M/s. IIT Bhubaneswar , M/s. ROSA power Supply Co. Ltd., UP , M/s. SLIET Longowal, Punjab , M/s. VERTEX TESTING LABORATORY PVT. LTD. , M/s. AArohi Enterprises, Raipur , M/s. Accurate Metaweld Services, Mumbai , M/s. Adarsh Enterprises, Rourkela , M/s.Amit Industries, Daman and Diu , M/s.Arun & Co., Ghaziabad , M/s.Ayush Scientific Emporium,Kanpur , M/s. Bajaj Energy Limited, Noida , M/s. Desmet Reagent Pvt. Ltd., Jamshedpur , M/s. Fine Chemical Products, Kolkata , M/s. Gaurav Scientific & Chemicals, Raipur , M/s. Hampi Chemicals, Ballari , M/s. Hindustan Traders, Rourkela , M/s. Jai Mangla Enterprises, Hazaribag , M/s. Jamshedpur Minerals and Chemicals, , M/s. KSK Mahanadi Power Comp. Ltd.,Hyderabad , M/s. Metal Work International, Kolkata , M/s.Micro Engineering & Testing Laboratory , M/s. Modern Rolls & Engineering Limited , M/s. Mounika Traders, Bellary , M/s. PENGG USHA MARTIN WIRES PRIVATE,JSR , M/s. Radha castings & Metalik Pvt. Ltd. , M/s. RHI india Pvt. Ltd., , M/s. SAIL, Bhilai , M/s. SGS India Private Ltd., Odisha , M/s. Shri Balaji Enterprises, Ghaziabad , M/s. V.S. Enterpsrises, Hospet , M/s. Volition Engineering Solutions LLP , Tata Power Company Ltd., Jamshedpur **, received technical and scientific support from NML in the area of chemical analysis and physical test of their raw materials and finished products.**

10. ECF Details

External Cash Flow (ECF) Status During: 2021-4-1 TO 2021-4-30

Category	TOTAL (Figures in Rs. Lakh)
Sponsored R&D	64.701
Grant-in-Aid R&D	0
R&D Consultancy	0
Technical Services	21.60456
Collaborative/ Cooperative R&D	0
Premia/Royalty	0
TOTAL	86.30556

END