



TC-8254
NABL Accredited Laboratory



सत्यमेव जयते
Ministry of Mines
Govt of India



JNARDDC

Jawaharlal Nehru Aluminium Research Development and Design Centre
Autonomous Body Ministry of Mines, Govt of India

About JNARDDC

Jawaharlal Nehru Aluminium Research Development and Design Centre, Nagpur is a centre of excellence set up in 1989 to create a research and development support system for the emerging aluminium industry in India by undertaking basic and applied research in the areas of bauxite, alumina and aluminium.

JNARDDC is an autonomous body of Ministry of Mines and is registered under Societies Registration Act, 1860 (455/87-Nagpur dated 13.8.1987) and Bombay Public Trust Act, 1950 (F-6778-Nagpur dated 8.10.1987) as a Trust.

JNARDDC is recognized as a scientific & industrial research organization by the Department of Scientific & Industrial Research, Ministry of Science & Technology, Government of India. It is the only institute of its kind in India pursuing the cause of R&D from bauxite to finished product under one roof.



JNARDDC was established as a joint venture supported by the Ministry of Mines, Government of India and United Nations Development Programme (UNDP) and has been fully functional since 1996. The serene setting of the campus coupled with a modern technical complex and state-of-the-art facilities provides an environment conducive for scientists to develop creative contributions to the technological growth of the Indian aluminium industry.

JNARDDC, with its limited and highly qualified manpower has developed speciality for providing high-grade technical support services to primary and secondary aluminium industries. The Centre has made key contribution in the areas of beneficiation, technological evaluation of bauxites, reduction of energy consumption & environmental pollution (by effective utilisation of aluminium industry residue materials such as red mud, dross, scrap etc.), aluminium process modelling and alloy development and indigenization. The Centre also offers analytical and testing facilities to other non-ferrous industries, steel plants, small-scale industries, R&D organisations and academic institutions particularly in the areas of chemical and mineralogical analysis, powder characterisation, thermal mapping, micro structural studies, mechanical and non-destructive testing, failure analysis and technical information.

JNARDDC is ISO 17025 : 2005 accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) for mechanical testing of non-ferrous alloys and chemical testing of bauxite, limestone, iron ore, and aluminum alloys.

DIRECTOR

An IIT-Kanpur alumnus, Dr Anupam Agnihotri has a Doctor of Philosophy Degree in Materials and Metallurgical Engineering from VNIT, Nagpur. Under UNDP, he has served as a visiting faculty to the University of Quebec in Canada as well as the Hungarian Research Institute. Dr Agnihotri is deeply involved in research activities on aluminium technology related to energy audit, environmental monitoring, modernization programs, low cost material alternatives etc. Presently, he is an integral member of several national-level projects such as the development of a Super Thermal Aluminium Conductor, Perform Achieve & Trade (PAT) studies and is also associated with DRDO's ambitious project on indigenization of aluminium alloys.

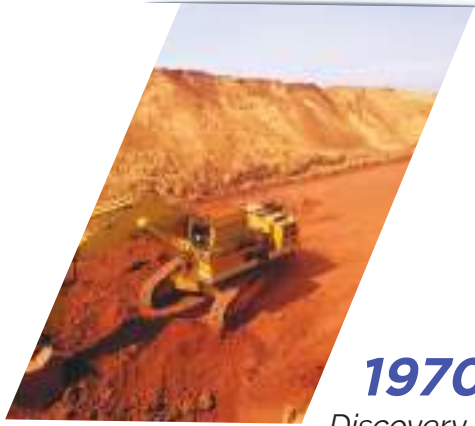


Dr Anupam Agnihotri

EMPLOYEES



Journey of JNARDDC



1970s

Discovery of East Coast Bauxite by GSI



1989

JNARDDC Established by MoM & UNDP



1996

JNARDDC Made Fully Functional



2014

Silver Jubilee Year



2018

29 Years of Commendable Service

Vision

Develop indigenous technologies and provide value addition services to both primary and secondary aluminium industries with a special emphasis on energy reduction and environmental sustenance through scientific research and development for industrial growth and socio-economic development

Mission

Provide modern technological inputs to aluminium industries and other sectors for value addition, reduction in energy / material consumption and environmental pollution based on optimum utilisation of existing facilities and further development of technical capabilities



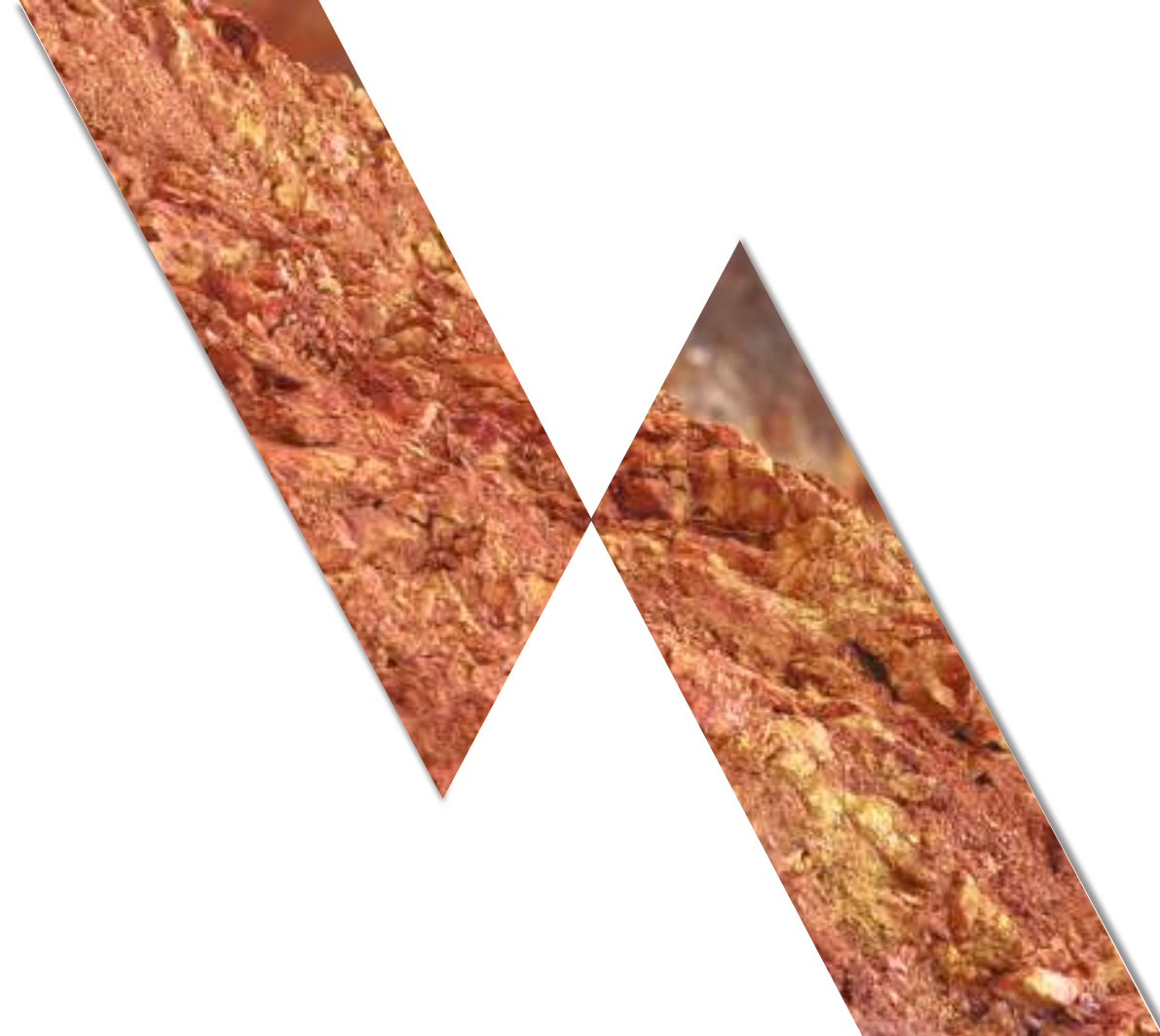
BAUXITE

- Principal ore of aluminium
- 5 to 7 kgs required to produce 1 kg of aluminium
- India has 5th largest deposits (3.8 billion tons) in the World

RESEARCH AREAS

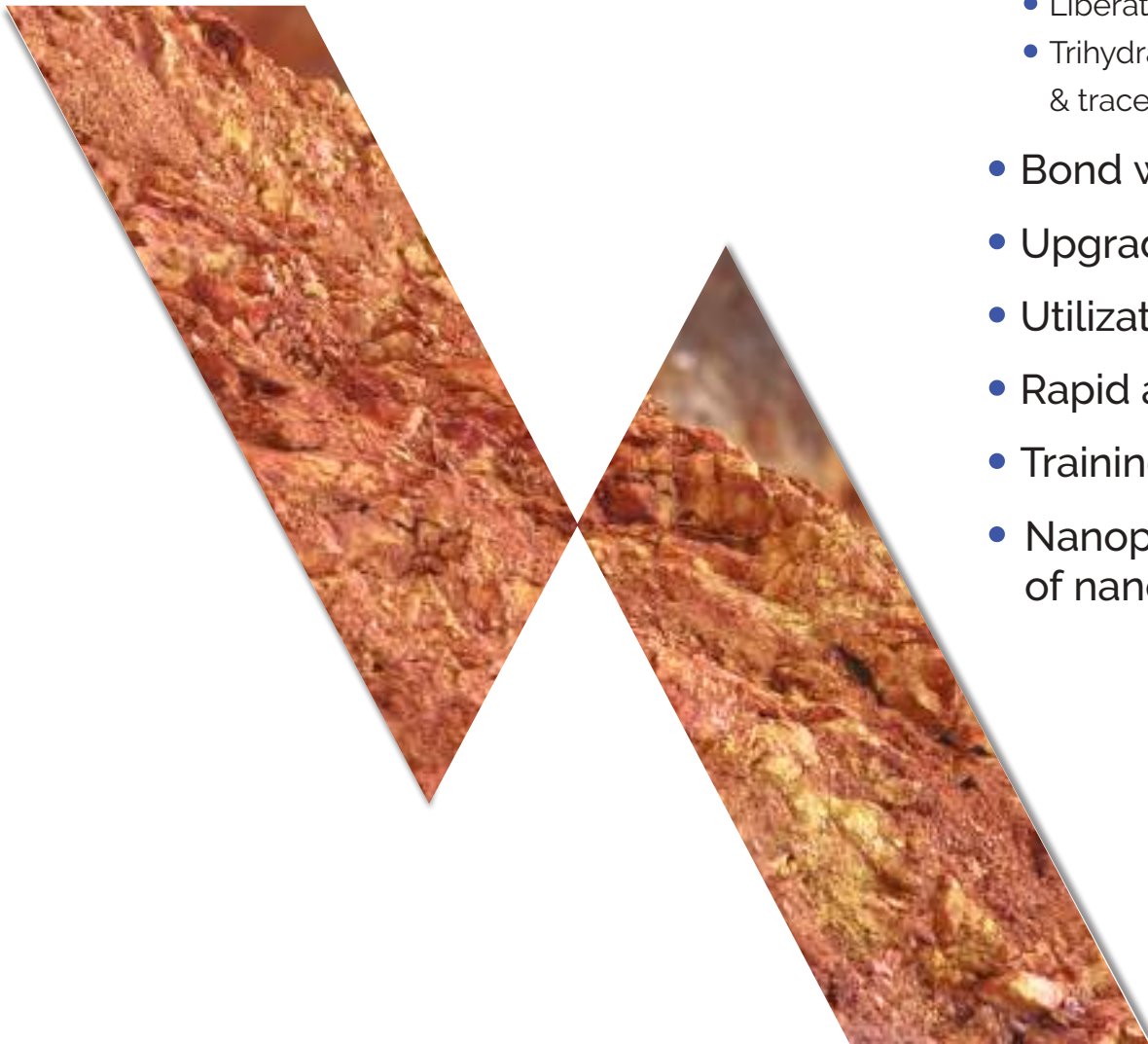
- Databank development
- Characterization
- Beneficiation
- Analytical techniques

- Process & product development
- Value addition of mine waste
- Geo-polymer development
- Rare earths extraction
- Nanotechnology



DOMAIN OF EXPERTISE

- Ore characterization and beneficiation
 - Chemical, mineralogy/phase analysis, morphology
 - Liberation studies (SEM-EDS & petrography)
 - Trihydrate alumina, monohydrate alumina, reactive silica, minor & trace elements
- Bond work index, Bulk density, Angle of repose
- Upgradation of low grade bauxite
- Utilization of laterite, PLK and Saprolite into products
- Rapid analysis of ore
- Training on bauxite characterization and beneficiation
- Nanoprocessing of industrial wastes and fabrication of nano-coatings





Geopolymer Brick Mini Pilot Plant



Bond Index Mill



Petrological Microscope



Granulating Machine



Multi Gravity Separator



Sample Preparation



Planetary Ball Mill



Hydrocyclone



Spin Coating Unit



Microwave Digester

ADDITIONAL FACILITIES

Laboratory Ferrous Wheel Separator | Wet High Intensity Magnetic Separator | Flotation Machine | Rotary Furnace
Rotap Sieve Shaker | Universal Impact Mill | Jaw & Roll Crusher





ALUMINA

- Alumina (Al₂O₃) is extracted from bauxite using the Bayer's process
- 2 kgs of alumina is required to produce 1 kg of aluminium
- Melting point is 2072°C
- India is 4th largest alumina producer in the World

RESEARCH AREAS

- Technological studies
 - Bayer's process unit operations
 - Process audit
-
- Special alumina
 - Red mud utilization
 - Non-metallurgical applications
 - Product and process development



DOMAIN OF EXPERTISE

- Pre-Desilication kinetics
- Desilication, digestion, precipitation & settling studies
- Mass and heat balance
- Energy audit of alumina refinery
- Optimization of process parameters
- Low soda hydrate & monohydrate production
- Optimization of liquor productivity
- Optimization of flocculent and crystal growth modifier
- Training on alumina technology





Precipitator



TOC Analyser



Potentiometric Titrator



Autoclave



Impact Mill



Bomb Digester



Large Scale Alumina Lab

ADDITIONAL FACILITIES

Low Temperature Bath Equipment | Equipment for Precipitation Tests | Mathematical Modelling
Brick Making Unit | Angle of Repose Apparatus



ELECTROLYSIS

A photograph of a molten metal stream being poured from a ladle into a long, narrow channel in a factory setting. The metal is bright orange and yellow, indicating high temperature. The background shows industrial machinery and a metal grate floor.

- Aluminium is extracted from alumina using the Hall-Heroult Process
- Requires 13-15 kWh to produce 1 kg aluminium
- India is 3rd largest primary metal producer in the World
- The energy consumption of the Hall-Heroult process costs for 80% of the total of the primary energy demand in aluminium production

RESEARCH AREAS

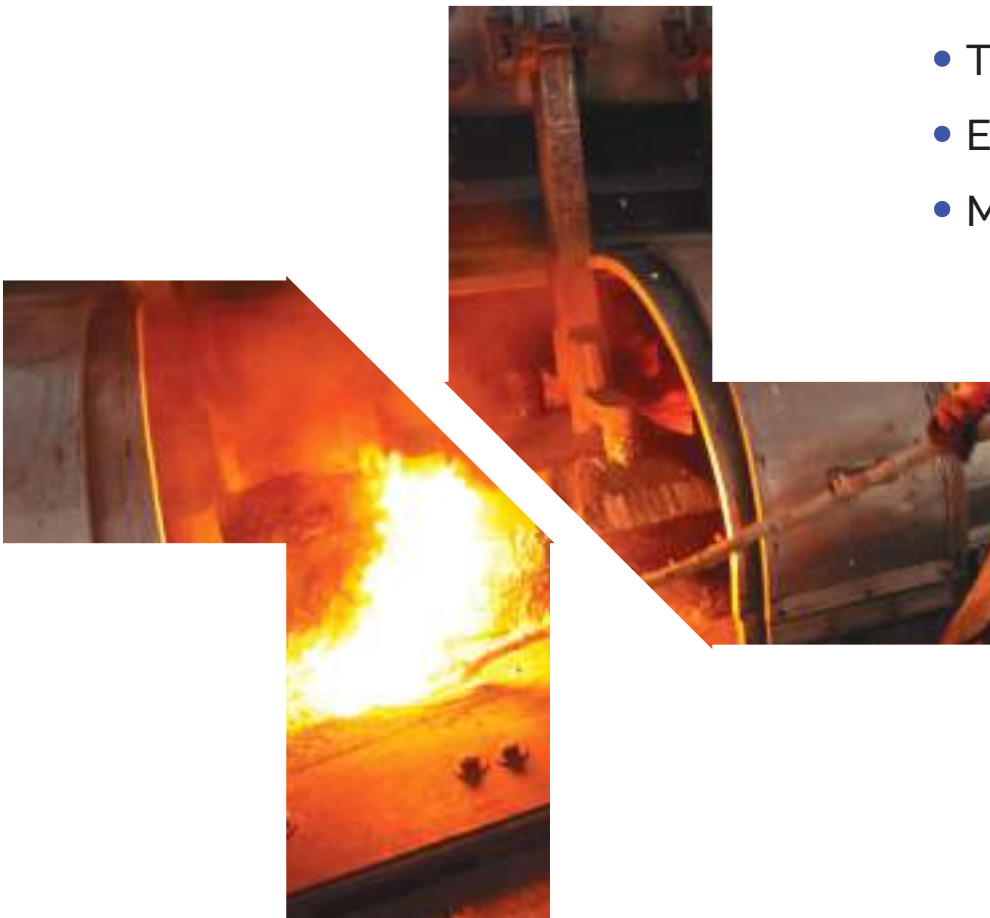
- Optimisation of operating parameters
- Process modelling & simulation
- Voltage & energy balance
- Energy audit

- Carbon
- Physical characterisation
- Sensors & instruments for process parameters
- Potline emissions



DOMAIN OF EXPERTISE

- Electrical, thermal and magnetic measurements of pots
- Electrolysis process modelling and simulation
- Probe for instant bath parameter analysis
- Alternative raw materials for aluminium electrolysis
- Training on aluminium smelter technology
- Energy reduction
- Measurement of PFC emissions





Mobile Lab



3-Axis Magnetometer



Potentiostat



Photoacoustic Spectrometer



Data Logger



Heat Flux Meter



Bench Scale Setup for SPL Treatment



Bath Parameter Analyzer

ADDITIONAL FACILITIES

Data Acquisition and Processing System | Liquidus Temperature Measuring Instrument
Mercury Intrusion Porosimeter | Helium Pycnometer





ALUMINIUM DOWNSTREAM

- Most abundant metal in the Earth's crust (8%)
- 2nd most used metal in the World
- Indian per capita consumption is 2.5 kg only

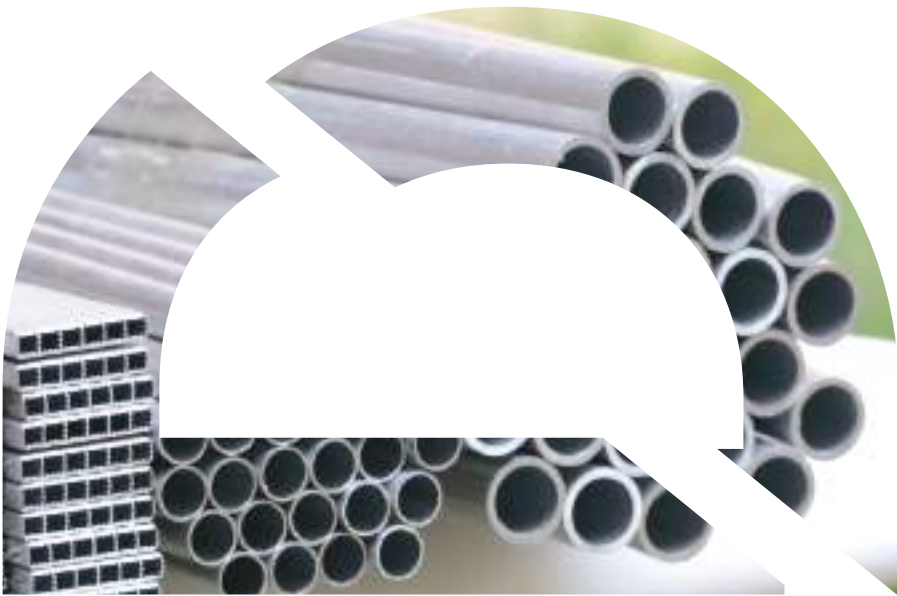
RESEARCH AREAS

- Development and Indigenization of aluminium alloys
 - Melt treatment and grain refinement
 - Casting, forming and joining of aluminium alloys
 - Heat treatment of aluminium alloys
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- Extrusion simulation & die design
 - Failure analysis
 - Recycling of aluminium
 - Anodisation



DOMAIN OF EXPERTISE

- Characterization of aluminium alloys
- Melt loss reduction in cast house/foundaries
- Quality improvements in DC cast and formed products
- Simulation and Modelling techniques for complex die profile
- Energy audit of cast house
- Optimization of heat treatment cycles
- Process for joining Al to Al, Cu & steel using Friction Stir Welding technique
- Improvements in yield and quality in aluminium recycling

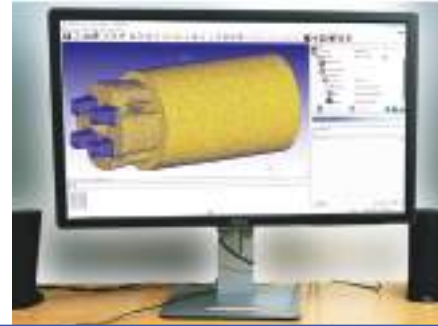




Metallurgical Microscope



Induction Melting Furnace



DEFORM Software



Micro Hardness Tester



Heat Treatment Furnaces



Anodisation Setup



FSW setup



UTM With Environment Chamber



Cupping Test



Electrical Resistivity Meter



Extrusion Press

ADDITIONAL FACILITIES

Extrusion Modelling and Simulation | Electro Polishing Machine
Ultrasonic Flaw Detector | Brinell Hardness Tester | Conductivity Meter | Roughness Meter



A glowing lightbulb is the central focus, emitting a warm, golden light. It is set against a dark, textured background. Several other lightbulbs are visible in the foreground and background, but they are unlit and appear as dark, reflective shapes. The overall mood is one of energy and illumination.

ENERGY

- Smelters are energy guzzlers
- World's aluminium smelters consume ~ 3.5% of total global electric power
- Aluminium smelting is only 40-50% energy efficient

DOMAIN OF EXPERTISE



Bath Parameters Analyzer



Low Thermal Conductivity Materials



Heat Treatment Process for STAL Conductor

- Energy audit program for aluminium industry
- Energy reduction programs for aluminium Industry
- Preventive maintenance for aluminium industry, power plants, railways and ports
- Aluminium sector expert under “National Mission for Enhanced Energy Efficiency” by BEE, Ministry of Power



ENVIRONMENT

- Globally, aluminium industry emits around 450 MT of CO₂eq annually (around 1% of World's total emission)
- 2.5 to 3 tons of red mud is generated per ton of aluminium
- PFC has global warming potential of 5000-10000 CO₂eq
- Spent pot linings contain leachable cyanide
- Aluminium industry is going to be carbon neutral by 2030

DOMAIN OF EXPERTISE



Detoxification Process for SPL



Light Weight Foamed Bricks (LWFBs)

- Measurement of PFC emissions
- Detoxification of Spent Pot Lining (SPL)
- Utilization of Red mud, SPL, Dross, Fly ash
- Geopolymer products from industrial rejects
- Recovery of valuables from industrial rejects
- Environmental laboratory for aluminium industry



Alum from Dross



Hard & Foam Layered Geopolymer



RESOURCE EFFICIENCY

- Aluminium helps protect the climate
- Aluminium is the best example of circular economy
- About 75% of all aluminium ever made is still circulating and is in use
- LCA of aluminium works on cradle to cradle basis
- Normally one kilogram of aluminium used in substitution of mild and high-strength steel in passenger cars and light trucks helps save more than 7.5 liters of fuel and reduces GHG emissions by 22 kilograms of CO₂eq in lifetime of the vehicle

DOMAIN OF EXPERTISE



Glass Ceramic Tiles



Proppant from PLK



Refractory Aggregates from Saproliite



Aluminium Sulphate from Waste Dross

- Circular economy
- Aluminium recycling
- Zero waste concept
- Value addition of industrial rejects



SUPPLEMENTARY RESEARCH FACILITIES



CNC Wire Cut EDM



SEM with EDS & EBSD



Particle Size Analyser



DSC - TGA



ICP - OES



Thermal Camera



Wet Chemical Lab



TLC



Surface Area Analyser



XRD



XRF



GDS - OES

Ion Analyser | Optical Scanning Densitometer | Thermal Analysis System
Geo-Polymer Brick Plant | Microwave Digestion System | Furnace

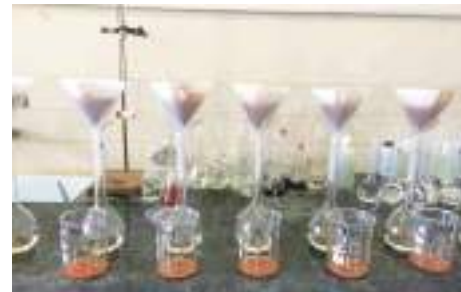
ADDITIONAL PRODUCTS & PROCESSES



Low Soda Hydrate



Bauxite Databanks



In-situ analysis of Al_2O_3 & SiO_2 for geo-analytical applications



Rapid analysis of reactive silica in bauxite & laterite



FSW Process



Die Design & Extrusion Simulation



Colourimetric analysis of Ca in hydrate, alumina & liquor



Selective enrichment of Fe_2O_3 in red mud

ORGANIZATION CHART



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OUR ASSOCIATES





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Development & Design Centre**
Autonomous Body, Ministry of Mines, Govt of India