

**MINISTRY OF MINES
INDIAN BUREAU OF MINES**



**PROPOSAL FOR
PROCUREMENT OF MINERAL PROCESSING,
MINERALOGY AND CHEMICAL ANALYSIS
EQUIPMENTS & INSTRUMENTS
AT
REGIONAL MINERAL PROCESSING LABORATORY,
BENGALURU
OF
INDIAN BUREAU OF MINES
THROUGH ASSISTANCE FROM
NATIONAL MINERAL EXPLORATION TRUST (NMET)**

SEPTEMBER, 2022

S. No.	CONTENTS	Page No.
I	Introduction	1
II	Importance of Beneficiation Study for Exploration Samples	2
III	Beneficiation Studies carried out by IBM on Exploration Samples	2-3
IV	Beneficiation study carried out at RMPL, IBM, Bengaluru	3-4
V	Projection of Number of Samples for Beneficiation Study on Exploration Mineral Blocks	4
VI	Status of Existing Facilities of IBM at RMPL, Bengaluru	5
VII	Requirement of New Facility and replacement of Existing Facility	5-6
VIII	Procurement of Equipment and Instruments for Mineral Processing Facility at RMPL, IBM, Bengaluru through assistance from NMET	6-12
IX	Summary	12-14

**PROJECT PROPOSAL FOR
PROCUREMENT OF MINERAL PROCESSING, MINERALOGY AND
CHEMICAL ANALYSIS EQUIPMENTS & INSTRUMENTS AT
REGIONAL MINERAL PROCESSING LABORATORY, IBM, BENGALURU,
THROUGH ASSISTANCE FROM
NATIONAL MINERAL EXPLORATION TRUST (NMET)**

I. Introduction

India is endowed with vast mineral resources comprising of varieties of ores. A lot of mineral potential areas of our country are still untapped. Scientific and systematic exploration in the mineral bearing areas followed by beneficiation studies is vital for nation's development. New and advance facilities are extremely essential for effective R&D in mineral processing for value addition and for upgradation of low and lean grade ores for their utilization.

Indian Bureau of Mines is the principal agency for undertaking ore beneficiation studies. Out of the three laboratories of IBM, the Regional Mineral Processing Laboratory situated at Bengaluru is one of the important laboratories and caters to the requirements of large mineral bearing areas of southern India, comprising states of Andhra Pradesh, Karnataka, Kerala, Tamil Naddu, Telengana, and Goa. Beneficiation studies on different ores and minerals viz. ferrous, non-ferrous, precious metal, industrial, strategic and critical minerals are carried out at RMPL, Bengaluru. Mineral Processing, mineralogy and chemical analysis of ores are vital in assessing economic viability of mineral deposits. As many of the ores of our country are of low grade in nature, modernization of Regional Mineral Processing facility through improved technology is utmost essential for upgradation of low grade and complex ores such as iron, manganese, bauxite, Rare Earth Elements (REEs), Platinum Group of Elements (PGEs), Gold, Silver, Nickel, Cobalt, Lithium, Molybdenum, Vanadium etc.

The National Mineral Policy, 2019 emphasizes the need for conservation of mineral resources through beneficiation keeping in view the present needs and future requirements. To overhaul the development of mineral resources in the country, major enhancement in mineral exploration and expansion of R&D activities in mineral beneficiation are vital aspects. In the NMP, 2019 IBM laboratories have been identified as the principal agency for undertaking beneficiation studies.

II. Importance of Beneficiation Study for Exploration Samples

Beneficiation study is the potential determining step for the exploration samples, since it throw light on the value of the mineral deposit based on the amenability of the sample to beneficiation for economic recovery. The viability of the deposit will be assessed based on the process economics. IBM conducts beneficiation studies on G2 & G1 level exploration samples to assess the amenability of the ore for upgradation for their industrial applications and to assess recovery of associated valuable minerals.

To pave the way for Make in India initiative and to meet the growing demand of Indian industry, utilization of low and lean grade ores are need of the hour. Only chemical analysis of the ore sample is inadequate to assess the economic viability of the deposit. The ore needs to be thoroughly characterized mineralogically to understand the occurrence of minerals, and their association with other gangue minerals, their interlocking nature, inclusions of gangue minerals in the mineral grain, and liberation size. Ores having varying characteristics and complex mineral assemblages requires thorough R&D studies for assessing their upgradability for utilization by different user industries, which needs to be addressed in multifaceted way to find case-specific solution for maximum utilization and for conservation of minerals. All the above necessitate the development of new and modern facilities to diagnose the problems in processing of different ores. Hence, beneficiation study has paramount and crucial role for the development of mineral deposits in India.

III. Beneficiation Studies carried out by IBM on Exploration Samples

IBM has been carrying out laboratory scale beneficiation studies on exploration samples of GSI, MECL and State DGMs. Since 2016, IBM is conducting beneficiation studies on exploration samples of GSI on free of charge (notional) basis. As per the recent policy decision taken in May 2022, Union Ministry of Mines has allowed IBM to exempt charges for beneficiation studies of State Government Department samples. Accordingly, IBM has started taking up beneficiation studies of State Government samples on free of charge (notional) basis.

IBM has conducted beneficiation studies on a large number of exploration samples comprising different ores and minerals received from various parts of the country. Till date beneficiation studies on total **138** mineral blocks have been completed and report were submitted by IBM to the respective organizations for auctioning. Out of these, more than a dozen of the mineral blocks comprising of Gold ore, Graphite ore, Copper-Lead-Zinc ores, Iron ore, Bauxite ore, Rock Phosphate etc have already been auctioned successfully and remaining blocks are under process of auction. For the current year, beneficiation studies on **13** mineral blocks are in progress. The year wise figure on beneficiation studies carried out by IBM on exploration samples is given in table 1.

Table – 1**Beneficiation Studies by IBM on Exploration Samples**

Year	Number of Mineral Blocks			Total
	GSI	MECL	State DGMs	
No. of Completed Projects				
2016-17	18	01	02	21
2017-18	28	06	--	34
2018-19	22	--	01	23
2019-20	17	03	--	20
2020-21	15	--	02	17
2021-22	17	03	01	21
2022-23 (till July, 2022)	02	--	--	02
Total	119	13	06	138
No. of Ongoing Projects				
2022-23 (till date)	10	02	01	13
Grand Total	129	15	07	151

IV. Beneficiation study carried out on Exploration samples at RMPL, IBM, Bengaluru

The Regional Mineral Processing Laboratory at Bengaluru is an important R&D base in the southern India and has facilities to carry out different varieties of ores and minerals. About two dozen exploration samples were carried out at RMPL, IBM, Bengaluru. The year wise figure on beneficiation studies carried out on exploration samples at RMPL, Bengaluru is furnished in table 2.

Table- 2**Beneficiation Studies carried out on Exploration Samples at RMPL, Bengaluru**

Year	Number of Mineral Blocks			Total
	GSI	MECL	DGMs	
No. of Completed Projects				
2016-17	1	1	-	2
2017-18	1	5	-	6
2018-19	3	-	-	3
2019-20	2	2	-	4
2020-21	3	-	-	3
2021-22	3	-	-	3
Total	13	8	-	21

No. of Ongoing Projects				
2022-23 (till date)	5	-	-	5
Grand Total	18	8	-	26

V. Projection of Number of Samples for Beneficiation Study on Exploration Mineral Blocks

The exploration activities in the country got a major boost due to the recent reforms in the mineral sector. A large number of mineral blocks are going to be auctioned in coming years and there would be significant increase in samples for beneficiation study by IBM.

Thrust on focused R&D is the need of hour to give impetus to “Atmanirbhar Bharat”. Future projections and challenges for Mineral Processing are enormous. In the new regime, auctioning of blocks for PL-cum-ML and participation of private exploration agencies would enhance exploration activities, which in turn would increase in number of projects for mineral beneficiation. It requires expanded and strong R&D base for their assessment for further utilisation.

The southern India states are endowed with wide spectrum of ores and minerals viz. Iron ore, Manganese ore, Beach Sand Minerals, REE, Gold ore, PGE ore, Graphite ore, Bauxite, Limestone etc. Exploration activities are being undertaken in these states by GSI, MECL, State DGMs, KIOCL, other central & state PSUs and by Private entities. There will be generation of more number of samples for beneficiation studies for RMPL, IBM, Bengaluru.

Projection on number of exploration samples likely to be taken up during coming 03 years is shown in table 3.

Table- 3

Projection of No. of Exploration Samples for coming 3 years

Year	Total No. of Mineral Blocks projected	Likely to be taken up by RMPL, Bengaluru
2023-24	30	7-9
2024-25	35	10-12
2025-26	40	12-14

To meet the requirements of exploration agencies for auctioning of mineral blocks and for effective R&D on different low grade & complex ores, replacement of existing equipments and addition of new facility for processing of precious, strategic and critical minerals are utmost essential.

VI. Status of Existing Facilities of IBM at RMPL, Bengaluru

The existing facilities at RMPL, IBM, Bengaluru is about 25 years old. A number of equipments are old and unserviceable. Due to the long use of the existing equipments in processing a large number of ores and by wear and tear, their efficiency has reduced and demand frequent repairs. The existing equipments are less energy efficient and inadequate to meet the present demands. Due to reduction in efficiency of the equipments and instruments, there is delay in completion of projects in time. The manufacturers are unable to provide service maintenance due to non-availability of spares and accessories.

Sophisticated analytical facilities are the need of the hour to deliver output by completing the analysis in time for the exploration agencies and for in-house beneficiation studies. By adopting rapid simultaneous multi-element analysis of radicals, it is possible to reduce the waiting time for chemical analysis and thereby the turn-around time of mineral processing investigations will be considerably reduced. Some of the facilities are to be replaced with the improved version of modern machinery and equipment and some of the modern machinery/equipments as new facility are to be added to enhance the capability of the laboratory.

VII. Requirement of New Facility and replacement of Existing Facility

(A) New Facility required at RMPL, Bengaluru

The southern states of our country are endowed with vast resources of iron ore, manganese ore, Gold ore, Beach Sand Minerals, REE, PGE, Molybdenum, graphite etc. The following new facilities are required for characterization, analysis and processing of different ores.

1.	High Intensity Magnetic Separator Induced Roll "Lift Type" Laboratory Model
2.	High temperature furnace 1600° C with gas inlet provision
3.	Hindered Bed Separator with feed pump and necessary accessories.
4.	Electrostatic Plate Separator
5.	Spiral HG and MG configuration (each 1 No.)
6.	Leaching circuit with autoclave for pressure leaching and solvent extraction unit
7.	Column flotation cells
8.	Thermogravimetry and Differential Thermal Analyser (TG-DTA)
9.	Inductively Coupled Plasma Optical Emission Spectrophotometer (ICP-OES) with microwave digester
10.	Carbon and Sulphur Analyzer
11.	Handheld XRF

(B) Replacement of Existing Facility at RMPL, Bengaluru

1.	Flotation cells - Rougher 3 cells (0.5 m ³ each) and Scavenger 1 cell (0.5 m ³) circuit with feed pumps, 2 conditioning tanks with agitator, along with flotation product and tailing pumps, reagent dosing system and pilot scale filtration system for concentrator and tails.
2.	Rock Cutting-cum-Automatic Thin Section Preparation equipment.
3.	Hydro-cyclone test rig assembly to test with different types of hydro-cyclones with product and tailing handling pumps with different cyclone arrangements.

Equipment and instrument wise detailed justification is given in section VIII. List of new facility required and replacement of existing facility is furnished in table 4.

VIII. Procurement of Equipments and Instruments for Mineral Processing Facility at RMPL, IBM, Bengaluru through assistance from NMET

To meet the above requirements, new facilities are to be created and existing facilities are to be replaced with advance models in the Mineral Processing Plant, Mineralogy and Chemical laboratories. Mineral beneficiation study includes detailed mineralogical characterization studies and chemical analysis of original bulk sample as well as study of process products generated in each stage of beneficiation test work. The products of each test work are studied by mineralogical methods and further input is given to optimize the process parameters and improve the grade as well as recovery.

Item wise justification and approximate cost.

(A) MINERAL PROCESSING EQUIPMENTS

1. High Intensity Magnetic Separator Induced Roll “Lift Type” Laboratory Model: New Facility.

It is used extensively for bench and pilot scale testing of granular materials (16 mesh to -400 mesh) at the rate of 50 Kg/hour and in actual production situations when separating two or more paramagnetic (weakly magnetic) materials from each other is required. The ‘lift type’ principle is also favoured in minerals research as a magnetic assay technique for obtaining nearly pure fractions of different paramagnetic minerals to facilitate their identification and determine their weight percentage. Virtually no entrapment of other materials is possible with this technique.

Useful for the separation of ilmenite from chromite; Monazite and other rare earth minerals from staurolite; Ilmenite from tantalite, columbite, struverite; ilmenite-leucoxene-rutile fractionation; natural diamonds from garnets etc.

Approximate cost: Rs. 35 Lakhs

2. High Temperature Furnace 1600° C with gas inlet provision: New facility.

High temperature furnace with gas inlet provision will enhance the capability to conduct high temperature roasting, calcination, reduction roasting in a controlled inert/ reducing atmosphere. The end user industry application of the mineral concentrate can be evaluated. Useful for production of proppants from bauxite, for production of sponge iron from limonite/goethite and for reduction roasting of nickel bearing concentrates for extraction of nickel.

Approximate cost: Rs. 30 Lakhs

3. Hindered Bed Separator with feed pump and necessary accessories: New Facility.

Hindered-bed separators are recognized as low-cost, high-capacity devices for both classification and density separation. This technique provides improved metallurgy. Useful for the enrichment of high specific gravity mineral concentrates.

Approximate cost: Rs. 40 Lakhs

4. Electrostatic Plate Separator: New Facility.

At present this laboratory has only drum type separator. It has some limitation in the working size range. Electrostatic Plate Separator will have lifting mechanism for treating fine sized material. Useful for the separation of zircon, rutile, garnet from beach sand minerals, manganese minerals, conducting minerals from silicate gangue minerals. Useful for the fine size separation of conducting minerals.

Approximate cost: Rs. 35 Lakhs

5. Spiral HG and MG configuration (each 1 No.): New Facility.

At present only wash water spiral and fines spiral are present. MG spiral will be utilized as rougher and scavenger spirals where the heavy mineral content is in the range of 35-40%. HG spiral has the option to treat high grade ores having 90% of heavy mineral. This is employed as rougher and cleaner circuit depending upon the heavy mineral content in the ore sample. Several industries are switching over from conventional tabling to spiral systems

which has the advantage of less footprint. Establishing the gravity concentration at pilot scale would give confidence to the mineral industry to set up such facility on continuous scale operation. Useful for the beneficiation of silica sand, beach sand, garnet, sillimanite, rare earth minerals, iron, tin, tungsten, chromite and manganese ore samples.

Approximate cost: Rs. 30 Lakhs

6. Hydro-cyclone test rig assembly to test with different types of hydro-cyclones with product and tailing handling pumps with different cyclone arrangements:

Replacement for existing simple size classification cyclone. The new cyclone arrangement will comprise of desliming cyclone, dewatering cyclone, double efficiency hydro-cyclone. These facilities are very much required to develop flowsheet with desliming circuit prior to gravity or flotation separation at plant scale on continuous mode of operation.

Approximate cost: Rs. 95 Lakhs

7. Leaching circuit with autoclave for pressure leaching and solvent extraction unit: New Facility.

Useful to conduct hydrometallurgical extraction of metals in acid/alkali circuit on continuous mode simulating CCD circuit. The pressure leaching facility could tackle the extraction of precious metal values from highly refractory ores and even tails. Solvent extraction facility could enrich the concentration of metal values suitable for electro-winning of the metal.

Approximate cost: Rs. 20 Lakhs

8. Column Flotation Cells: New Facility.

Very much required to evaluate the technology. Since, many process plants replace mechanical flotation cells with column cells for their better performance and less footprint in process plant. The existing cleaner flotation cells can be replaced with column flotation cell. As many industries are using such facility in the plant scale operation, it is necessary to have pilot scale testing facility while going for pilot scale studies.

Approximate cost: Rs. 40 Lakhs

9. Flotation Cells - Rougher 3 cells (0.5 m³ each) and Scavenger 1 cell (0.5 m³) circuit with feed pumps, 2 conditioning tanks with agitator, along with flotation product and tailing pumps, reagent dosing system and pilot scale filtration system for concentrator and tails:

Replacement for the old flotation batteries where the impeller are worn out due to extensive use. The modern circular cells have energy as well as performance efficient and are replacing conventional cells with less foot print. Filtration system is useful for the filtration of concentrate and tails in plant scale operations. Moisture content in the final filtered cake and water recovery for the plant circuit can be evaluated by the experiments. The complete flotation and filtration system is very much essential to scale up the laboratory scale flow sheet and to test on continuous mode.

Approximate cost: Rs. 175 Lakhs

(B) MINERALOGY INSTRUMENT & EQUIPMENTS

- 1. Thermogravimetry and Differential Thermal Analyser (TG-DTA):** New Facility.

TG-DTA is a thermal analyzer useful in characterization of ores by measuring the weight gain and loss of different mineral phases w.r.t. temperature, which helps in quantification of hydrous/Loss-on-Ignition bearing mineral phases like clay, gibbsite, goethite, carbonates etc. Differential Thermal Analysis is very essential and crucial where the ore is complex nature and minerals are poorly crystalline and thoroughly intermixed like low grade iron ores, bauxite and lime stone samples. This facility is not available at RMPL Bangalore.

Approximate cost: Rs. 90 Lakhs

- 2. Rock Cutting-cum-Automatic Thin Section Preparation equipment along with accessories and ancillary units:** Replacement for the existing facility.

The existing manual rock cutting and polishing grinding machine is very old and not in working condition. Diamond cutting wheels are completely corroded. The unit often poses service issues. Hence the old unit needs a replacement.

Approximate cost: Rs. 45 Lakhs

(C) CHEMICAL ANALYSIS INSTRUMENTS

- 1. Inductively Coupled Plasma Optical Emission Spectrophotometer (ICP-OES) with microwave digesting system:** New Facility.

Simultaneous multi-elemental analyses are required to tackle quick turnaround times and meet lower detection limits for analysis of different ores while delivering high levels of accuracy, with lower maintenance. Microwave digester reduces the considerable amount of time in digestion

and bringing the metal values in solution.

Approximate cost: Rs. 90 Lakhs

2. Carbon and Sulphur Analyzer: New Facility.

Carbon and Sulphur analysis is useful in the estimation of C, S content in coal, graphite and for other ores.

Approximate cost: Rs. 35 Lakhs

3. Handheld XRF: New Facility.

Required for quick assessment of Si, Al and Fe to decide the flux composition for fire assay analysis of gold in exploration samples. Useful for quick and real time analysis of samples to reduce the time to assess whether grade improvement is taken place or not during beneficiation stages.

Approximate cost : 40 Lakhs

Table - 4

List of requirements of New Facility and Replacements of existing facility

Sl. No.	Name of Equipments/Instruments	Remarks
(A) Process Equipments		
NEW FACILITY		
1.	High Intensity Magnetic Separator Induced Roll "LiftType" Laboratory Model,	The new facility is required for bench and pilot scale testing of granular materials (16 mesh to -400 mesh) at the rate of 50 Kg/hour. The 'lift type' magnetic technique useful for obtaining nearly pure fractions of different paramagnetic minerals to facilitate their identification and determine their weight percentage.
2.	High temperature furnace 1600°C with gas inlet provision	High temperature furnace with gas inlet provision will enhance the capability to conduct high temperature roasting, calcination, reduction roasting in a controlled inert/ reducing atmosphere. . Useful for study of bauxite, iron ore, nickel ore.
3.	Hindered Bed Separator with feed pump and necessary accessories	Hindered-bed separators are recognized as low-cost, high-capacity devices for both classification and density separation. This technique useful for the enrichment of high specific gravity mineral concentrates.

4.	Electrostatic plate separator	The new facility with lifting mechanism can handle fine size material. Useful for the separation of zircon, rutile, garnet from beach sand minerals, manganese minerals, conducting minerals from silicate gangue minerals. Useful for the fine size separation of conducting minerals.
5.	Spiral HG and MG configuration (each 1 No.)	MG spiral will be utilized as rougher and scavenger spirals where the heavy mineral content is in the range of 35-40%. HG spiral required to treat ores having 90% of heavy mineral. This is employed as rougher and cleaner circuit depending upon the heavy mineral content in the ore sample. Useful for the beneficiation of silica sand, beach sand, garnet, sillimanite, rare earth minerals, iron, tin, tungsten, chromite and Mn ore samples.
6.	Leaching circuit with autoclave for pressure leaching and solvent extraction unit	The new facility is useful to conduct hydrometallurgical extraction of metals in acid/alkali circuit on continuous mode simulating CCD circuit. The pressure leaching facility would be useful for extraction of precious metal values from highly refractory ores and even tails. Solvent extraction facility could enrich the concentration of metal values suitable for electro-winning of the metal.
7.	Column Flotation cell	Very much required to evaluate the technology. Since, many process plants replace mechanical flotation cells with column cells for their better performance and less footprint in process plant. The existing cleaner flotation cells can be replaced with column flotation cell. As many industries are using such facility in the plant scale operation it is necessary to have pilot scale testing facility while going for pilot scale studies.

REPLACEMENT OF EXISTING FACILITY

8.	Flotation cells - Rougher 3 cells (0.5 m ³ each) and Scavenger 1 cell (0.5 m ³) circuit with feed pumps, 2 conditioning tanks with agitator, along with flotation product and tailing pumps, reagent dosing system and pilot scale filtration system for concentrator and tails	The modern circular cells have energy as well as performance efficient. Filtration system is useful for the filtration of concentrate and tails in plant scale operations. Moisture content in the final filtered cake and water recovery for the plant circuit can be evaluated by the experiments. The complete flotation and filtration system is very much essential to scale up and to test on continuous mode.
9.	Hydro-cyclone test rig	The new cyclone arrangement will comprise of desliming cyclone, dewatering cyclone,

	assembly to test with different types of hydro-cyclones with product and tailing handling pumps with different cyclone arrangements.	double efficiency hydro-cyclone. These facilities are very much required to develop flowsheet with desliming circuit prior to gravity or flotation separation at plant scale on continuous mode of operation.
(B) Mineralogy Instrument & Equipment		
NEW FACILITY		
10.	Thermogravimetry and Differential Thermal Analyser (TG-DTA)	TG-DTA is very essential for complex ores and poorly crystalline and intermixed phases present in iron ores, bauxite and lime stone samples for quantification of hydrous/LOI bearing mineral phases like clay, gibbsite, goethite and carbonate minerals.
REPLACEMENT OF EXISTING FACILITY		
11.	Rock Cutting Cum Grinding Automatic Thin Section Preparation equipment alongwith accessories and ancillary units	It is essential for cutting of rock/ore specimens, cores of exploration blocks for preparation of thin and polished sections for mineralogical studies.
(C) Chemical Analysis Instruments		
NEW FACILITY		
12.	Inductively Coupled Plasma Optical Emission Spectrophotometer(ICP-OES) with microwave digestion system	Required for simultaneous multi-element analyses of ores in lower detection limits i.e ppm and ppb level with high levels of accuracy. The microwave digestion system will considerably reduce the sample preparation time.
13.	Carbon and Sulphur Analyzer	It is useful in the estimation of C, S content in coal, graphite and in other ores.
14.	Handheld XRF	Required for quick assessment of Si, Al & Fe to decide the flux composition for fire assay analysis of gold. Useful for quick and real time analysis of samples to reduce the time to assess whether grade improvement is taken place or not during beneficiation stages.

IX. Summary

The proposed equipments and instruments for beneficiation facilities for RMPL, IBM, Bengaluru is utmost essential to meet the requirements of exploration activities of southern sectors of India. So that proper assessment of mineral blocks can be made for auctioning and mineral deposits can be exploited economically. The list of equipments, instruments, quantity and approximate cost is given in table 4.

Table-4**LIST OF EQUIPMENTS & INSTRUMENTS REQUIRED FOR RMPL, IBM, BENGALURU**

Sl. No.	Name of Equipment/Instruments	Quantity	Approx. Cost in Rs. (Lakhs)
(A) MINERAL PROCESSING EQUIPMENTS			
New Facility			
1	High Intensity Magnetic Separator Induced Roll "Lift Type" Laboratory Model	1	35
2	High temperature furnace 1600 ° C with gas inlet provision	1	30
3	Hindered Bed Separator with feed pump and necessary accessories	1	40
4	Electrostatic plate separator	1	35
5	Spiral HG and MG configuration (each 1 No.)	1	30
6	Hydro-cyclone test rig with product and tailing handling pumps with different cyclone arrangements	1	90
7	Leaching circuit with autoclave for pressure leaching and solvent extraction unit	1	25
8	Column Flotation cells	1	40
Replacement of Existing Facility			
9	Flotation cells - Rougher 3 cells (0.5 m ³ each) and Scavenger 1 cell (0.5 m ³) circuit with feed pumps, 2 conditioning tanks with agitator, along with product and tailing pumps, reagent dosing system and pilot scale filtration system.	Whole Circuit	175
(B) MINERALOGY			
New Facility			
10	Thermogravimetry and Differential Thermal Analyzer (TG-DTA) 1600°C with necessary accessories	1	90
Replacement of Existing Facility			
11	Rock cutting cum automatic thin section preparation equipment along with accessories and ancillary units.	1	45
(C) CHEMICAL ANALYSIS			
New Facility			
12	Inductively Coupled Plasma Optical Emission Spectrophotometer(ICP-OES) with microwave digestion system	1	90
13	Handheld XRF	1	40
14	Carbon and Sulphur Analyzer	1	35
Total			800

Mode of Procurement: The above mentioned 14 numbers of equipments, instruments and their ancillary units will be procured through GeM bidding.

Time Line for Procurement: Procurement of the above equipment and instruments will be completed within 18 months after approval and allotment of fund.

Sr. No.	Laboratory wise no. of equipments, instruments	Approx. Cost in Rs. (Crore)
A	Mineral Processing Equipments (9 nos.)	5.00
B	Mineralogy (2 nos.)	1.35
C	Chemical Analysis Instruments (3 nos.)	1.65
	Total	8.00

The proposed R&D facilities will form a strong base for beneficiation study on exploration samples for country's development. It is earnestly requested that the required funds may be made available through NMET for procurements of the above mentioned mineral processing, mineralogy and chemical analysis equipments and instruments for mineral beneficiation studies on exploration samples at RMPL, IBM, Bengaluru.
