

Training Course

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on

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National Metallurgical Laboratory (CSIR)
Jamshedpur-831007, India

**MINERAL PROCESSING
AND
NONFERROUS
EXTRACTIVE METALLURGY**

(For Management Trainees of UCIL)

JUNE 30 – JULY 5, 2008

Compiled & Edited by

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**NATIONAL METALLURGICAL LABORATORY
JAMSHEDPUR - 831 007**

TRAINING COURSE
ON
MINERAL PROCESSING AND NON-FERROUS EXTRACTIVE METALLURGY

PATRON

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प्रो० सूर्य प्रताप मेहरोत्रा
निदेशक

PROF. S. P. MEHROTRA
DIRECTOR



FOREWORD

The nuclear industry throughout the world is experiencing a dilemma of resource exhaustion, technological innovations, and economic challenges. The energy needs particularly have put enormous pressure on increased consumption of base and rare metals/rare earths and nuclear metals over the past few decades, calling for devising newer and effective methodologies to utilize available resources/ low grade reserves, besides recycling wastes and by-products. This has provided a momentum for development of novel techniques in mineral beneficiation/processing, metal extraction, separation, and environmental controls. This also calls for a re-look at the present practices and formulate suitable innovative approaches to cater to the requirements of energy security of the country.

In order to put forth a helping hand to the young brains in nuclear industry, Uranium Corporation of India Limited (UCIL), Jaduguda, the Mineral Processing and Non-ferrous Extractive Metallurgy Groups at National Metallurgical Laboratory, Jamshedpur, have initiated this training programme to pay attention to the above issues. The purpose of the programme is to provide an overview of the fundamental aspects of mineral beneficiation/processing and procedures for hydro- and pyrometallurgical processing applicable to non-ferrous metal extraction, in general, and uranium and rare earths in particular. Specific examples of the potential processes in vogue, developed globally, and their relevance to Indian resources will be highlighted.

I am happy to note that a proceeding volume containing the lecture materials is also being brought out, which encompasses both the theoretical and practical aspects of the subject. I certainly hope that the participants will be greatly benefited by the review of the basic concepts in mineral processing and extractive metallurgy, and the exposure to the upcoming trends and innovations in these areas through lectures and demonstrations.

I wish the training programme a grand success.


(S.P.Mehrotra)

30th June 2008**[Venue: - Old Conference Hall]**

9:30 AM - Registration

9:45 AM - Welcome and Briefing about the Training Programme

10:00 AM - About CSIR (VIDEO SHOW)

10:30 AM - Tea

◆ Technical Sessions Starts from 11:00AM onwards

Sl.No.	Lecture (L)/Demonstration(D)		Time	
L-1	Mineralogical Characterization	Dr. B. Nayak Dr. M. K. Mohanta	11:00am	12:00pm
L-2	Chemical Characterization	Shri. K. K. Gupta Dr. S. Chakraborty	12:00pm	12:35pm
L-3	Communion and Classification- Theory & Practises	Dr. A. Das	12:30pm	1:30pm
LUNCH BREAK [1:30PM - 2:00PM]			Venue: - MNP Pilot Plant	
D-1	Optical Microscopy	Dr. B. Nayak Dr. M. K. Mohanta Ms. Mamta Sharma	2:00pm	2:30pm
D-2	Spiralling	Dr. Vinod Kumar Mr. Srinivas Rao	2:30pm	3:15pm
TEA BREAK [15 min]				
D-3	Hydrocycloning	Dr. Ratnakar Singh Dr. R. K. Rath	3:30pm	4:15pm
D-4	Jigging	Dr. R. K. Rath Dr. Ratnakar Singh	4:15pm	5:00pm
1st July 2008			[Venue: Lecture Hall]	
L-4	Gravity Concentration- Recent Trends	Dr. Ratnakar Singh	10:00am	11:00am
TEA BREAK [15 min]				
L-5	Magnetic and Electrostatic Separation in Beneficiation of Low Grade Ores & Minerals	Dr. A. Das	11:15am	12:15pm
L-6	Dewatering	Dr. R. P. Bhagat	12:15pm	1:15pm
LUNCH BREAK [1:15PM - 2:00PM]			Venue: - NML Auditorium Foyer	
D-5	Iron Ore Washing Circuit	Mr. K. K. Bhattacharya Dr. Vinod Kumar	2:00pm	2:45pm
D-6	Magnetic Separation	Dr. K. V. Rao Dr. A. Vidhyadhar	2:45pm	3:15pm

TEA BREAK [15 min]				
D-7	High Tension Separation	Dr. K. V. Rao Dr. A. Vidhyadhar	3:30pm	4:15pm
D-8	Froth Flotation	Dr. R. K. Rath Dr. Ratnakar Singh	4:15pm	5:00pm
2nd July 2008		[Venue: Lecture Hall]		
L-7	Principles of Extractive Metallurgy	Dr. Rakesh Kumar	10:00am	11:00am
TEA BREAK [15 min]				
L-8	Thermodynamic/Kinetic Considerations in Metal Extraction	Dr. S. Ranganathan	11:15am	12:15pm
L-9	Environmental Issues in Metal Extraction	Dr. A. Bandhopadhyay	12:15pm	1:15pm
LUNCH BREAK [1:15PM - 2:00PM]		[Venue: - NML Auditorium Foyer]		
D-9	Biohydrometallurgy and Uranium Extraction) Demo on Uranium Extraction by Bacteria b) Biosorption of Metals	Dr. K. D. Mehta / Mr. Abhilash	2:00pm	3:45pm
TEA BREAK [15 min]				
D-10	a) Pressure Hydro-metallurgy b) Leaching of Metals from Sea Nodules and Redox Potential Monitoring	Dr. S. K. Sahu Dr. R. K. Jana Shri. T. B. Singh Shri. N. S. Randhawa	4:00pm	5:15pm
3rd July 2008		[Venue: Lecture Hall]		
L-10	Surface Chemistry Aspects of Mineral Processing	Dr. R. K. Rath	10:00am	11:00am
TEA BREAK [11:00 - 11:15 AM]				
L-11	Advances in Froth Flotation With a Particular Reference to Processing of Fines	Dr. Ratnakar Singh	11:15am	12:15pm
L-12	Agglomeration of Ore Fines	Shri. K. K. Bhattacharya	12:15pm	1:15pm
LUNCH BREAK [1:15PM - 2:00PM]		[Venue: - NML Auditorium Foyer]		
D-11	Jameson Flotation Cell	Dr. A. Das Mr. S. Chandrasekhar	2:00pm	2:45pm
D-12	Multi-Gravity Separator/ Floatex Density Separator	Mr. S. Chandrasekhar Dr. A. Das	2:45pm	3:15pm

TEA BREAK [15 min]				
D-13	Contact Angle / Zeta Potential	Dr. R. K. Rath Dr. A. Vidhyadhar	3:30pm	4:15pm
D-14	Tabling / Pelletization	Dr. K. V. Rao Dr. A. Vidhyadhar	4:15pm	5:00pm
4th July 2008		[Venue: Lecture Hall]		
L-13	Metallurgy of Light Metals	Dr. S. Ranganathan	10:00am	11:00am
TEA BREAK [15 min]				
L-14	Extraction of Base Metals (Cu, Ni & Co)	Dr. S. K. Sahu	11:15am	12:15pm
L-15	Separation Processes- Solvent Extraction/Ion Exchange for Metal Ions	Dr. V. Kumar	12:15pm	1:15pm
LUNCH BREAK [1:15PM - 2:00PM]		[Venue: - NML Auditorium Foyer]		
D-16	Smelting of Ocean Nodules Residue	Dr. R. K. Jana Shri. Sanjay Agrawal	2:00pm	3:30pm
TEA BREAK [15 min]				
D-17	Metal Separation: a) Cu/Ni by SX b) Metals by IX c) Electrowinning	Dr. Archana Agrawal Dr. Manoj Kumar Shri. D. Bagchi	3:45pm	5:15pm
5th July 2008		[Venue: Lecture Hall]		
L-16	Melting and Casting of Non-Ferrous Metals/ Alloys	Dr. K. L. Sahoo	10:00am	11:00am
TEA BREAK [15 min]				
L-17	Recycling of Metals from Secondary Resources-Treatment Options	Dr. K. K. Sahu	11:15am	12:15pm
L-18	Mechanical Activation of Solids in Extractive Metallurgy	Dr. Sanjay Kumar	12:15pm	1:15pm
LUNCH BREAK [1:15PM - 2:00PM]		[Venue: - NML Auditorium Foyer]		
D-18	Melting and Casting	Dr. K. L. Sahoo Dr. D. Mandal	2:00pm	3:15pm
TEA BREAK [15 min]				
D-19	Mechanochemical Activation	Dr. Sanjay Kumar Shri. T. C. Alex	3:15pm	4:15pm
VALEDICTORY SESSION (Lecture Hall)		Chaired by Director, NML	4:15pm	5:15pm

Part - 1

MINERAL PROCESSING

A. Das, R. Singh, B. Nayak and K. K. Bhattacharya

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