Brief C.V of Dr G .V. Rao, Scientist-G
Institute of Minerals and Materials Technology[CSIR]-Bhubaneswar

Dr. G.V.RAO is the Chief Scientist [Equivalent to Joint Secretary, Govt. of India] at the Institute of Minerals and materials Technology, formerly Regional Research Laboratory (CSIR), Bhubaneswar, since 2003.
Dr Rao, born on 25th June 1953 in Srikakulam dist,A.P, obtained his Bachelor degree in Chemical Engineering, Masters and Ph.D in Mineral Process Engineering from department of Chemical Engineering, Andhra University, Visakhapatnam, A.P. After one year service as teaching faculty in Mineral Beneficiation, joined IMMT, Bhubaneswar as Scientist-B in 1978.

Dr Rao had 32 years R&D experience in the area of Mineral Processing and has associated in more than 50 sponsored, collaborative, consultancy and advisory consultancy projects.
He has published and presented around 73 Technical papers in Inter National & National journals and Seminars/Conferences. He has also filed 7 patents.

Dr Rao has contributed a chapter on "Nickel and Cobalt Ores: Flotation:" in the "**Encyclopedia of Separation Science**" at the invitation of Editorial Board of Ms. Academic Press, U.K. which was published in 2000

Dr Rao was a member of the editorial board of **International journal Physical Separation in Science and Engineering** published by Taylor and Francis group and currently the member of editorial board of SGAT Bulletin, published by Society of Geo Scientists and Allied Technologists, India

Dr Rao has co-edited two seminar proceedings volumes published by Ms Allied Publishers, New Delhi and a Book entitled Mineral Resources and Beneficiation plant practices.

Dr Rao has two and half years R&D experience at the Institute of Aufbereitungs Technique, Technical University of Aachen, Germany during 1985-87 and 1993. Two months R&D experience at Western Africa during 2010.

Dr Rao is a specialist in flowsheet development for beneficiation of lean and complex ores [Mineral Processing] and carved niche in Column flotation , plant auditing - trouble shooting .Dr Rao also supports mineral industry by undertaking DPR preparation and takes up consultancy assignments of plant detailing and optimization of operating mineral beneficiation plants.

Dr Rao advocated the flotation column utility in the country extensively by carrying out the feasibility demonstrations at the Plant site of Hindustan Copper Ltd [at Rakha,], Uranium Corporation of India Ltd [Jaduguda]and Sikkim Mining Corporation[Rangpo] and Hindustan Zinc Limited [Rajpura-Dariba mines].

He has contributed significantly in sizing of commercial flotation columns of 300 tpd capacity [1.75 M dia X 12M , 2nos in series] and carried out the performance evaluation and optimization of the

commercial columns installed at Rajpura-Dariba mines of Hindustan Zinc Limited in the zinc cleaning circuit and also erected a commercial flotation column for copper cleaning at Rangpo Complex sulphide ore of Cu-Pb-Zn Beneficiation plant of SMC, Sikkim

Dr Rao has vast experience in beneficiation of many low grade ores like iron, manganese, chromite, complex sulphide ores of Cu, Pb and Zn, calcite, phosphate, tungsten, antimony,sillimanite, graphite, and value addition from wastes like Cu-converter slags, alumina refinery plant sand, nickel bearing lateritic material, beneficiation plant tailings like chromite and copper.

He has successfully audited the operating beneficiation plants of Uranium Corporation of India Limited [900 tpd byproduct recovery plant of Cu-Ni-Mo], Tamilnadu Mineral's 200 tpd graphite beneficiation plant at Shivaganga, Sikkim Mining Corporation's 100 tpd Cu-Pb-Zn complex sulphide ore plant at Rangpo, Jindal's 200 tpd chromite ore beneficiation plant at Sukinda and improved these plant performances significantly.

The latest beneficiation plant metallurgical audit conducted by Dr Rao to Jindal Stainless Limited at Sukinda, Orissa has resulted in Rs 5.4 Crores additional profit per annum by adapting the suggestions of Dr Rao, as acknowledged by JSL officials. The other significant contribution is his recently completed metallurgical Plant audit in December 2010 on 1000 tph phosphate ore beneficiation plant at Senegal, Western Africa for ICS, Senegal. ICS-Senegal is implementing his suggestions as acknowledged.

Dr Rao has transferred two novel beneficiation technologies to industries on 13th April 2008 on Recovery of chromite values from the chromite ore beneficiation plant tailings to M/S Jindal Stainless Ltd. [JSL] and on recovery of ilmenite and zircon from the waste plant sand of alumina refineries to M/s National Aluminium company[NALCO].

Currently Dr Rao is rendering the consultancy assistance to Jindal Stainless Limited in setting up the 500 tpd chromite recovery plant at Sukinda, Orissa [the flowsheet & DPR was supplied by Dr Rao & team to JSL with Dr Rao as the Project Leader] which is on commercial trial runs now.

A proposal for setting up 25-30 tph ilmenite and zircon recovery from plant sand as per the flowsheet developed by Dr Rao was submitted as desired by NALCO and is under active consideration by NALCO to adopt this new technology.

In recognition of his outstanding contributions in the area of Mineral Processing,
Dr Rao was awarded many prestigious awards like

1.**Metallurgist of the Year Award-2001** from Ministry of Steel, Govt of India,
2.Annual Mineral Beneficiation Award -2005 from IIME professional Society, Jamshedpur
3.Sita Rama Rungta Memorial Award in 2000 by SGAT professional Society and
4**. Two Best Paper Awards by IIME & SGAT in 1998, 99 respectively**.

Dr Rao delivered many Key note Lectures in International Symposia and delivered Lecture courses for M.Tech [Mineral Processing] students at Gulbarga University, Sandur.
and to the Plant Engineers and operators of Shivaganga Graphite beneficiation plant, Tamilnadu.

Research Projects Completed during 2006-2010 by Dr GVRao :

Sponsored / Collaborative Projects

1.Beneficiation and flowsheet development studies to enrich nickel from nickel bearing material of KANSA deposit, Orissa.(For Jindal Stainless Ltd) **[Project Leader]**

2. Beneficiation of low grade antimony ore by column flotation { For CESCO Chemicals- New Delhi}[Team member]

****3.Developmment of beneficiation flowsheet for low grade chromite ore from Sukinda and the feasibility to recover the chromite values from the COB plant tailings[For Jindal Stain less Ltd]*
[**Project Leader**]

****4.Development of viable process flowsheet to recover Titanium values and Iron from the Plant Sand of NALCO"s Aluminium Refinary, Damanjodi, (For NALCO)[* **Project Leader** ***]***

5.Characterization and recovery of copper values from low grade copper tailing dump of Mufulira copper mine of Zambia (For Shapoorji Pallonji Co Ltd.) **[Project Leader]**

6.Characterization and beneficiation of low grade manganese ore of Jindal Stainless Ltd.{ for Jindal Stainless Ltd] [Team member]

*** **PROJECTS whose Technology was released to Sponsor on 13 th April 2008 by His Excellency Gov. of Orissa.**

Consultancy Projects:

1 Evaluation of Plant performance by auditing the chromite ore beneficiation plant of Jindal stainless Limited. (for Jindal Stainless Ltd) **[Project Leader]**

2.Preparation of detailed project report for 20 tph capacity low grade chromite ore beneficiation plant and for chromite recovery from the COB plant tailings of M/S Jindal Stainless Limited.{ For Jindal Stainless Limited] [**Project Leader**]:

3.Consultancy services for modification in the chromite ore beneficiation circuit and overseeing the performance improvement of the COB plant of Jindal Stainless Limited [For Jindal Stainless limited] **[Project Leader]**

4.Consultancy services for evaluation of plant performance data and audit of the phosphate beneficiation plant at Senegal and to advise on matters related to gold ores, copper and other minerals including value addition from mine and mineral wastes.{ For ICS,Senegal} **[Project Leader]**

Current Ongoing Projects: 2010-11

Consultancy Projects

1. Consultancy assistance for setting up of the 500 tpd commercial chromite beneficiation plant and to assist in its flotation plant performance evaluation. {For Jindal Stainless Ltd} [**Project Leader]**
2. Preparation of Technoeconomic feasibility report for 700 tpd low grade rock phosphate ore beneficiation plant for RSMML,Rajasthan, Workorder was received from RSMML & to Start from Sept 2011**.[Project Leader]**

Sponsored Projects

1. Development of beneficiation flowsheet to recover chromite from the tailings of OMC chromite ore beneficiation plant [For Orissa Mining Corporation] ,[**Project Leader]**

KEY NOTE LECTURES DELIVERED

1. G.V.RAO

" Fundamentals of Flotation, classification & Processing of low grade ores by Column Flotation"

3 Invited Lectures delivered for Post Graduate Students of Mineral Process Engineering , Gulbarga University, Sandur ,Karnataka on the Invitation of the University. 2003

2. G.V.RAO

"Problems associated with complex sulphide ores of India and the probable approach for their better utility".

Keynote Lecture At National seminar on " Investment opportunities in mining sector of India in 21st Century, Problems & Opportunities. Bhubaneswar, 27-28th June 03.

3.G.V.RAO

"An over view of PGE minerals characterization, pre-concentration and recovery"

Key note Lecture At National Seminar on Exploration for platinum group elements {PGE} Gold & Diamonds in India.19-20th July 2007, NGRI, Hyderabad.

4.G.V.RAO

"Exploitation of PGEs resources of India and the intricacies involved in upgradation"

Invited Lecture at Dept of Geology , Dharward University , Karnataka, 2008

5.G.V.RAO

"Need for exploitation of complex and low grade ores and value addition"

Invited Lecture by the Mining Engineers Association of India, Hyderabad Chapter ; 28th September 2008

6.**G.V.RAO**

"Mine waste management-Need for Beneficiation Techniques".

Key Note Address in the Technical Session of Panel Discussion on " Judicious Exploitation of Mineral Resources & Mine waste Management-& Future Goals, 11-12th July 2009, Hyderabad, Organized by Mining Engineers Association, Hyderabad-Chapter.

7.**G.V.RAO**

"Latest Techniques of beneficiation of gold ores and optimum recovery."

Key note Lecture at National Seminar on " Gold Industry in India: Resources, Reserves, Mining, Metallurgy & Environment " 28-29th May 2009,Bangalore.

8. G.V.RAO

" Problems associated with recovery of PGE from PGE bearing ores & Indian Scenario."

Invited Lecture on 18th Sept at MATEX-INDIA, Bangalore [organized by Geological Society of India, Bangalore]2009 .

9. **G.V.RAO**

"Recovery practices of PGMs from PGE bearing ores and the Indian PGE Scenario".

Key note Lecture at International Symposium on Magmatic Ore deposits –ISMO-09 held at Bhubaneswar, 1-4th Dec, 2009

10. G.V.RAO

a) Problems associated with Chromite ores of India- Intricacies in beneficiation of low grade chromite ores"

b) Advances in PGE ores preconcentration and the conceptual flowsheet to treat Indian PGE ores

The above 2 Keynote Lectures were delivered at Bangalore in a Training Course on recent advances on Chromite,PGE and Cu-Ni sulphide deposits in the context of ultramafic-mafic rocks of Dharwar craton, India, organized during 3-6th June 2010 by GSI, at Bangalore,

11. G.V.RAO

Invited Presentation on *" Process options for utilizing Indian Lateritic Ni resources of Sukinda, Orissa ,India".*

Ministry of Mines, Govt of India; 4th April 2011, At Secretary, MOM office, New Delhi

12. G.V.RAO

Invited Presentation on *" Gold & Precious Metals status & 12th Plan action plan"*

Ministry of Mines, Govt of India, 10th June 2011 at MOM Office,New Delhi

TWO NATIONAL TECHNOLOGY DAY INVITED LECTURES
ON NATIONAL TECHNOLOGY DAY -11th MAY
on the Invitation of the NALCO

A. Process Options for exploiting the Lateritic Chromite Overburden of Sukinda Chromite mines of Orissa . On 11th May 2007 at Damanjodi, NALCO

B. Value addition from the waste plant sand of Damanjodi Alumina refinery,NALCO On 11th May 2008 at Angul.NALCO

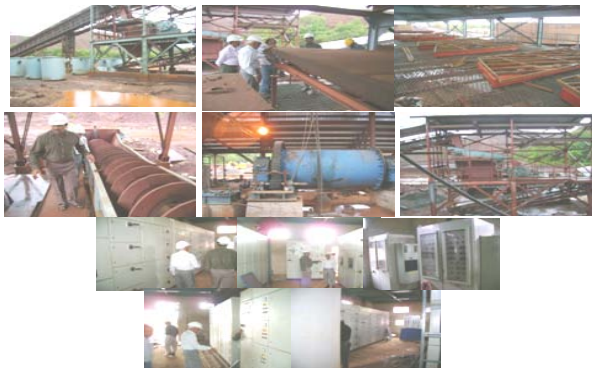
PATENTS

1. **G.V RAO** & T.G.Charan
   A Process for Enriching Nickel from Lateritic Overburden
   material of Chromite Mines -Case -A. PATENT NO.179535 dated 9th Dec 1998.
2. **G.V RAO** & TG Charan
   A Process for Enriching Nickel from Lateritic Overburden
   material of Chromite Mines -Case -B PATENT NO.180187, 30th Oct 1998
3. **G.V.RAO** , B.C.ACHARYA, J.N.MOHANTY, P.DUTTA,Y.V.SWAMY. and A.K.TRIPATHY
   A process for Beneficiation of high iron and phosphorous bearing manganese ore.
   : 199835 dated 6th oct 2006.
4. **S.B.KANUNGO**, S.K.MISRA, D.BISWAL & G.V.RAO
   An Improved Process for the Beneficiation of Manganese Ores
   199538 dated 15th December 2006.
5. **G.V.RAO**
   A process for improvement of grade and recovery of P_2O_5 from low grade rock phosphate ore
   996/del/2001, dated 27th Sept 2001.
6. **G.V.RAO,** SK BISWAL, VN MISRA
   A process for beneficiation of chromite from low grade ferruginous chromite ore by flotation
   0651 del 2007 dated 23rd march 2007.
7. **G.V.RAO**, D.KIRAN KUMAR, RAJEEV & VN MISHRA
   A Process for enrichment and recovery of Titania and Zircon values from the waste Plant sand of aluminium refinery : 0906 del 2006 dated 30th march 2006.

SOME OF THE COMMERCIAL PLANTS INSTALLED IN THE COUNTRY FROM THE R&D CONTIBUTIONS OF DR GVRAO

1.75 M X 12 M Commercial Columns
Installed at DARIBA, HZL for Zinc cleaning

0.3 M x 12 M Commercial column for Cu cleaning installed at Rangpo, Sikkim



500 tpd Chromite recovery plant involving gravity & flotation circuits from the tailings of chromite ore beneficiation plant Installed at Sukinda, Orissa for Jindal Stainless Ltd.

Dr Rao has held many column flotation feasibility demonstrations at various Organizations & at their respective plants to impart the training to their plant operators while demonstrating his R&D outcome

Demonstration at Rakha Mines, HCL to recover molybdenite from Cu Concentrate

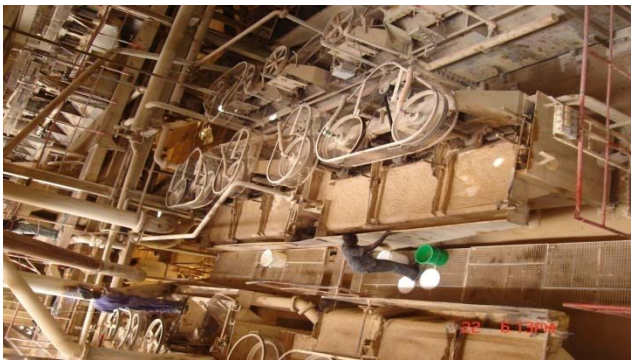
Column flotation demonstration at SMC Plant, Rangpo:

Demonstration at UCIL Plant, Jaduguda to recover moly from Cu-Ni-Mo bulk concentrate

BENEFICIATION PLANT METALLURGICAL AUDITING & TROUBLESHOOTING

Plant audit at Complex Cu-Pb-Zn ore beneficiation plant of Sikkim Mining Corporation, Rangpo

Plant Audit of 250 tpd Chrmite ore beneficiation plant of JSL at Sukinda,Orissa



Metallurgical Plant audit of 1000 tonnes per hour phosphate ore beneficiation plant of ICS-Senegal, Western Africa

Developed a novel commercial viable flowsheet to enrich & recover TiO_2 and ZrO_2 from waste plant sand of NALCO

demonstration to NALCO OFFICIALS






Enrichment of TiO_2 to > 40% TiO_2 from plant sand containing 9% TiO_2 at ~ 60% Recovery: Also demonstrated the enrichment and recovery of Zircon to ~ 60% ZrO_2 from feed containing 0.42% ZrO_2

This Technology was Released to NALCO on 13th April 08





Demonstration of production of refractory grade chromite concentrate by jigging and high grade chromite concentrate by Tabling/ hydro Sizer & Spiral to TATA STEEL officials at IBM, Pilot Plant, Nagpur.
"Project on Recovery of chromite from low grade ferruginous chromite ore of Sukinda, Orissa ".
Feasibility of chromite enrichment from ferruginous chromite ore was demonstrated on column for the first time

Pilot scale demonstrations at IBM,MIDC plant at Nagpur [above]
&

BOOKS/SEMINAR PROCEEDINGS (Edited)

1. Mineral Processing ,waste and Environment Management
   [Eds] **GVRAO**, B.Das, SRS Sastri & HS Ray**.}**
   Seminar Proceedings volume , 1-2nd Feb,2000; Allied Publishers ,New Delhi: ISBN- 81- 7023-961-3

2. Mineral Resources and Beneficiation plant Practices in India
   Book [Eds] SRS Sastri, KS Raju, KKRao and **GVRAO** ISBN 81-900726-2-5, 2000

3. Mineral Processing Technology
   Int. Seminar Proceedings Volume 19-21st Feb 2004, by (Ed)**G.V.RAO** and V.N.Misra,
   Allied Publishers, New Delhi. ISBN 81-7764-599-4,2004.
4. Process flowsheets of selected Industries in Orissa
   (Eds) K.K.RAO, SWATI MOHANTY & **G.V.RAO**
   Released on the eve of Golden jubilee celebration of IIChE Bhubaneswar-Regional Centre on 23 rd August 1997)

5. Flotation of Nickel and cobalt (metallic ores) by **G.V.RAO**
   A chapter written for the **Encyclopedia of Separation Science**, 2000
   Chapter written at the invitation of by Academic Press, UK

Co-edited two seminar proceedings volumes & One Book on
Mineral Resources & Beneficiation plant practices

Receiving

the Prestigious annual IIME-MINERAL BENEFICIATION AWARD-2004 from his Excellency Sri Syed Sibtey Razi, Governor of Jharkhand On 6th January 2005 at ISM-Dhanbad for outstanding contributions in the field of Mineral Engineering

Receiving the BEST PAPER PUBUSHED AWARD from Indian Institute of Mineral Engineers, H.Q Jamshedpur , 2000

The Two papers published in Trans. IIM, on Column flotation feasibility to recover molybdenite from Copper Concentrate,of Rakha :Part-A & B.

- Receiving

the Prestigious METALLURGIST OF THE YEAR AWARD -2001 from Ministry of Steel, Govt, of India, for significant contributions in the area of Energy and Environment

- Receiving the " SITARAMA RUNGTA MEMORIAL AWARD " for Outstanding contributions in the area of Mineral Beneficiation" from SGAT in 2000

- Receiving the

IIMB- Metallurgist Award "for the year 1994-95 from Indian Institute of Metals, Bhubaneswar Chapter

This award was conferred for the successful column flotation demonstration at Plant site of Rakha

- The first plant site demonstration of column flotation application in 1991 in India

AWARDS RECEIVED in recognition of Significant R&D Contributions