

ARIJIT BISWAS

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Date of Birth: 04th June 1980

PERSONAL PROFILE:

Numerate graduate with broad Chemical, Mathematical and Artificial Intelligence knowledge and proven leadership skills, seeks a position in an industry whose interests are challenging, invigorating and to gain rich experience and exercise my engineering and technological skills.

RESEARCH INTEREST:

Design of chemical and metallurgical flowsheets and process, Multi-objective optimization, Genetic Algorithms, Application of multi-objective optimization to chemical and metallurgical problems, Population balance modeling and Reactor design.

EDUCATION:

- **Indian Institute of Technology**, Dept. of Metallurgical Department, Kharagpur, India

PhD thesis for approved and final viva on 12th February 2011.

Summary of PhD Work: The focus of the research is on extraction of manganese from manganese based polymetallic nodules which has been classified as low grade ore using hydrometallurgical route. The project mainly deals with flowsheeting aspect for designing of hydrometallurgical circuit for leaching out manganese and other metals like Cu, Ni and Co from the gangue matrix of the nodules. Process optimization combined with process flowsheeting has been used to design the plant and tuned using the experimental plant data. Kinetic study is one of the investigative tools which are used

with flowsheeting aspect to know the dissolution kinetics of manganese into leach solution which has led to productivity. The project also deals with designing of reactor and even reactor configuration to find the best design which leads to maximum productivity and minimum operating cost. Hysys has been used quite effectively to design the separation of ammonia from ammonia leach liquor. Genetic algorithm and neural network and other tools of artificial evolution combined works as tools for optimization and predictive analysis.

Other Research Projects During PhD Tenure

Production of Hydrogen from Metallurgical Flue Gas with Minimization of CO₂ emission

This research project is based on clean development mechanism to reduce the CO₂ emission from iron and steel industry. As most of the metallurgical gases have major share of CO/CO₂ in the gas which can be converted into syngas and CO₂ can be captured.

- **Birla Institute of Technology and Science, Pilani, India**
Master of Engineering, Chemical Engineering, (Jan 2004-Dec 2005)
Thesis Title: "Evolutionary Algorithms for Multi objective optimization of different Chemical Process System."
CGPA: 7.58/10
- **Dr.C.V.Raman Institute of Technology, Nagpur University, Nagpur, India**
Bachelor of Technology, Chemical Technology with specialization in Oil, Fat and Surfactant Technology, (July 1999-July 2003)
Project Title: Simulation and design of Shell and Tube Heat Exchanger.
Percentage: 77.0% (First Class with Distinction)

EXPERIENCE

Evaluation of Metal Extraction from Poly Metallic Sea Nodules,

Company: **Department of Metallurgical Engineering, IIT Kharagpur**

Duration: **January 2010 - August 2010**

Position: **Research Associate**

The work profile includes:

1. Consultancy work on extraction of metals like Mn, Cu, Ni and Co from sea nodules. This includes data analysis, flowsheet designing, evaluation of existing flowsheeting, Mass Balance based analysis, Optimization operation for the flowsheet, Kinetic modeling for dissolution of metallic values from ores.
2. Consultancy work on production of ferro and Silico manganese from manganese residue. This activity includes thermodynamic calculations (Using FactSage) for the production of ferro manganese from the residue, optimization of ferro alloy production process with various changing raw material from upstream. Complete data analysis and mass balance combined with thermodynamic evaluation of the process.

Research Projects on Copper Extraction

Company: **Aditya Birla Science and Technology Center, Aditya Birla Group, Mumbai**

Duration: **September 2010 – Till Date**

Position: **Deputy Manager (Research)**

The work profile includes research projects on copper as well on alumina. The main activities are:

1. Data analysis and application data mining for analysis of production data to establish the relationship between input and output using nonlinear data tools. To understand the complete trend of various process parameter and trend analysis using soft sensor techniques like artificial neural network models.
2. Thermodynamic modelling of copper system like slag cleaning operation for minimization of copper loss in fayalite slag. The work is governed by data analysis, elementary mass and energy balance, followed by thermodynamic calculations using FactSage. In relation to copper loss, optimization of process inputs which affect the copper loss in direct relationship.
3. Material and energy balance of various copper and alumina process.
4. Lab development for pyrometallurgical operation.

PRIZES AND SCHOLARSHIPS

Name of the Scholarship: "Sandwich PhD/Post-doc" scholarship programme 2009-10 sponsored by Science and Technology Service, French Embassy in India.

Duration: 8 months (April 2009-December 2009)

Place: University of Strasbourg and CNRS, Strasbourg, France.

KEY SKILLS:

Technical Skills

Good command in the basic concepts of chemical engineering and Mathematics, additionally experience in

- C, C++ and Java programming
- Parallel Programming: Nvidia CUDA programming (Beginner)
- Non Traditional Optimization Techniques and Artificial Neural Networks.
- Proficient with many scientific packages (MATLAB, FLUENT, HYSYS, ASPEN PLUS, FactSage, HSC Chemistry).
- Programming using Advance features in Microsoft Excel and spreadsheet applications.

Academic Projects:

- **Advanced Mass Transfer**, June 2004
 - Simulation of Cyclo-hexane synthesis Plant using HYSYS.
 - Simulation of multi component extraction column.
 - Simulation of multi component distillation using Relaxation method.
- **Advanced Separation Technology**, June 2004
 - Study of Nano Filtration Membrane at different operating process conditions.
- **Process Plant Simulation**, June 2004
 - Modeling and simulation of Novel Membrane Reactors for removal of dissolved oxygen.

- **Evolutionary Computation**, Jan 2005
 - Single and Multi objective optimization of different problems using Evolutionary Algorithms.

PUBLICATION:

Conference Publications:

- **Biswas, A.**, Chakraborti, N., and Sen, P.K., 2007. "Simulation and optimization of non ferrous metals recovery from lean ores in a hydrometallurgical circuit." Proceedings of National Metallurgical Day (NMD-2007), Mumbai, India, pp.249-250.
- **Biswas, A.**, Chakraborti, N., and Sen, P.K. "Optimization of non ferrous metal recovery from lean ores in a hydrometallurgical circuit using multi-objective evolutionary and Genetic algorithms." Proceedings of 6th International symposium on hydrometallurgy, Hydrometallurgy 2008, Phoenix, USA, pp. SME publishers.
- **Biswas, A.**, and Sen, P.K., "Reduction of carbon dioxide from metallurgical flue gases: A case study." Proceedings of National seminar on CCST-2008, September 2008, Kolkata, India.
- **Biswas, A.**, Chakraborti, N., and Sen, P.K., "Use of process optimization and cost model for metal recovery from manganese nodules: The role manganese recovery." Accepted in international conference on Ocean Marine Science (ISOPE), 2009.

Journal Publications:

- **Biswas, A.**, Chakraborti, N., and Sen, P.K. "Multi-objective optimization of low grade manganese ore treatment using genetic algorithms." Presented in International conference on Neural network and genetic algorithm in materials science and engineering (NGMS 2008) and publication in Materials and Manufacturing Sciences, 2009, 24, 22-30.

- **Biswas, A.**, Chakraborti, N., and Sen, P.K. "A Genetic Algorithms based multi-objective optimization approach applied to a hydrometallurgical circuit for ocean nodules" *Mineral Processing and Extractive Metallurgical Review*, 2009, 30,163-189.
- Pettersson, F., **Biswas, A.**, Sen, P.K., Saxén, H., Chakraborti, N. "Analyzing leaching data for low grade manganese ore using neural nets and multi-objective genetic algorithms." *Materials and Manufacturing Processes*, 2009, 24,320-330.

SPOKEN LANGUAGES:

- English, Hindi, Bengali, Marathi, German (beginner) and French (beginner).

ACHIEVES:

- Second in inter college level Technical Quiz Competition, held at Hislop College, Nagpur in 2002.
- Stand 4th in ME chemical Engineering, at BITS Pilani.
- Regional Swimmer at school level Nagpur in 1995-96.

EXTRA CURRICULAR ACTIVITIES:

- Student Auditor of JCB Hall of Residence, IIT Kharagpur, 2007-2008.
- Active Member of Illumination and Rangoli festival, IIT Kharagpur,2007-2008
- Active Member of chemical engineering association, BITS Pilani,2004-2005

REFERENCES:

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IIT Kharagpur

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