Curriculum Vitae

Name : **Dr. Chinmaya Kumar Sarangi**

Designation : **Principal Scientist**

Organization : CSIR-Institute of Minerals and Materials Technology (CSIR-IMMT), Bhubaneswar, INDIA, 751 013

Academic Qualifications :

B. Tech in Metallurgical and Materials Engineering – N I T Rourkela, India
M. Tech in Metallurgical and Materials Engineering – I I T Kharagpur, India
PhD in Metallurgical and Materials Engineering – I I T Kharagpur, India

Research Areas :

Electrometallurgy, Membrane-electrolysis and corrosion, process development and engineering for metal extraction from primary and secondary resources, flowsheet integration and testing, industrial effluent and waste treatment for recovery of valuable metals, electrochemical synthesis and characterization of nanocrystalline materials.

Experience : Fifteen years of R&D experience in the field of extractive metallurgy, materials processing and characterization. Particularly in process flowsheet development to recover non-ferrous metals from different primary ores and secondary resources such as wastes, secondaries, scrap, sludge, etc., bench and pilot scale testing of hydro-electrometallurgical processes, electrowinning of base metals and alloys, treatment of solid and liquid wastes for the recovery of value-added products, electrochemical synthesis of battery grade materials and reaction kinetics.

Address for communication :

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Membership of Professional Societies / Institutions :

(i) Life Member of the Indian Institute of Metals (IIM)
(ii) Life Member of the Indian Institute of Mineral Engineers (IIME)

Honours / Awards :

- Awarded the INSTITUTE SILVER MEDAL for securing first position in M Tech of the Department of Metallurgical and Materials Engineering at IIT Kharagpur.

Patents

International

1. An electrochemical system and process for the reduction of nitric acid concentration using electrolytic cell (Patent No. US 20150291451 A1; WO 2014057505 A4).
2. Hydrometallurgical process for the recovery of tellurium from high lead bearing copper refinery anode slime. (Patent No: US 9630844 B2).
3. Green process for the preparation of pure iron. (Patent No. US9879331B2)

Indian

4. A pyro-hydrometallurgical process for the recovery of alumina and calcium silicate from flyash (Patent File No: 201611001044)

SCI Publications

1. Structure and property of pulse electrodeposited nanocrystalline nickel-tungsten-copper alloy coating, **C.K. Sarangi**, B.P. Sahu, B.K. Mishra, R. Mitra, *Journal of Applied Electrochemistry*, Vol 51 (2021) 1157–1174.
2. Pulse electrodeposition and characterization of graphene oxide particle-reinforced Ni-W alloy matrix nanocomposite coatings, **C.K. Sarangi**, B.P. Sahu, B.K. Mishra, R. Mitra, *Journal of Applied Electrochemistry*, Vol 50 (2020) 265–279.
3. Effect of annealing on structure and properties of pulse electroplated Ni-W alloy coating, **C.K. Sarangi**, B.P. Sahu, B.K. Mishra, R. Mitra, *Journal of Metallurgy and Materials Science*, Vol 62 (2020) 107–121.
4. Estimation of hydrogen flow rate in atmospheric Ar:H_2 plasma by using artificial neural network, S. Das, D.P. Das, **C.K. Sarangi**, B. Bhoi, *Neural Computing and Applications*, Vol 32 (2020) 1357–1365.
5. R&D efforts of CSIR-IMMT towards solving some issues related aluminium production, R.K. Dwari, **C.K. Sarangi**, S.M. Mustakim, B. Dash, B.C. Tripathy, M.K. Ghosh, S. Basu, *Journal of Sustainable Metallurgy*, Vol 6 (2020) 9-17.
6. Raman analysis of the formation of dithionate during copper electrowinning, T. Subbaiah, **C.K. Sarangi**, K. Sanjay, M.M. Sundaram, *Erzmetall World of Metallurgy*, 72(2) (2019) 92-98.
7. Effect of Zr content on structure-property relations of Ni-Zr alloy thin films with mixed nanocrystalline and amorphous structure, Bibhu Prasad Sahu, **Chinmaya Kumar Sarangi**, Rahul Mitra, *Thin Films*, Vol 660 (2018) 31-45. (Impact Factor: 1.888)
8. Optical emission spectroscopy study of Ar-H_2 plasma at atmospheric pressure, S. Das, D.P. Das, **C.K. Sarangi**, B. Bhoi, B.K. Mishra, J. Ghosh, *IEEE Transactions on Plasma Science*, Vol 46(8) (2018) 2909-2915. (Impact Factor: 1.325)
9. Influence of synthesis temperature on the growth and surface morphology of Co_3O_4 nanocubes for supercapacitor applications, Rashmirekha Samal, Barsha Dash, **Chinmaya Kumar Sarangi**, Kali Sanjay, Tondepu Subbaiah, Gamini Senanayake, Manickam Minakshi, *Nanomaterials*, Vol 7(11) (2017) 356. (Impact Factor: 4.034)
10. Reactor and column leaching studies for extraction of copper from two low grade resources: A comparative study, Sandeep Panda, Geetanjali Mishra, **Chinmaya Kumar Sarangi**, Kali Sanjay, Tondepu Subbaiah, Subir Kumar Das, Kadambini Sarangi, Malay Kumar Ghosh, Nilotpala Pradhan, Barada Kanta Mishra, *Hydrometallurgy*, Vol 165(1) (2016) 111–117. (Impact Factor: 3.465)

11. Role of hydrazine and hydrogen peroxide in aluminium hydroxide precipitation from sodium aluminate solution, N.K. Sahu, **C.K. Sarangi**, B. Dash, B.C. Tripathy, B.K. Satpathy, D. Meyrick, I.N. Bhattacharya, *Transactions of Nonferrous Metals Society of China*, Vol 25 (2015) 615-621. (Impact Factor: 2.338)
12. Recovery of Co metal and Electrolytic Manganese Dioxide (EMD) from Co–Mn sludge, A. Biswal, S. Mahakud, Sandhyarani Bhuyan, B. Dash, **C.K. Sarangi**, Kali Sanjay, B.C. Tripathy, T. Subbaiah, I.N. Bhattacharya, Sung-Ho Joo, Shun Myung Shin, K.H. Park, *Hydrometallurgy*, Vol 152 (2015) 159–168. (Impact Factor: 3.465)
13. Enhanced recovery of nickel from chromite overburden (COB) using Dissimilatory Fe (III) reducers: A novel Bio-Reduction Acid Leaching (BRAL) approach, Jacintha Esther, Sandeep Panda, Lala Behari Sukla, Nilotpala Pradhan, **Chinmaya Kumar Sarangi**, Tondepu Subbaiah, *Hydrometallurgy*, Vol 155 (2015) 110-118. (Impact Factor: 3.465)
14. Effect of urea on decomposition of sodium aluminate solution, N.K. Sahu, **C.K. Sarangi,** B.C. Tripathy, I.N. Bhattacharya and B.K. Satpathy, *Journal of the Taiwan Institute of Chemical Engineers*, Vol 45 (2014) 815-822. (Impact Factor: 3.834)
15. Copper electrodeposition from sulfate solutions – Effects of selenium, A. Baral, **C.K. Sarangi,** B.C. Tripathy, I.N. Bhattacharya and T. Subbaiah, *Hydrometallurgy*, Vol 146 (2014) 8-14. (Impact Factor: 3.465)
16. Electro-crystallization of antimony from acidic and alkaline baths in diaphragm-less cell, **Chinmaya Kumar Sarangi**, Ayonbala Baral, Jayasmita Panigrahi, Kali Sanjay, Tondepu Subbaiah, Barada Kanta Mishra, *Advanced Materials Research,* Vol 828 (2014) 65-72.
17. Recovery of copper from a surface altered chalcopyrite contained ball mill spillage through hydrometallurgical route, S. Panda, P.C. Rout, **C.K. Sarangi,** S. Mishra, N. Pradhan, U. Mohapatra, T. Subbaiah, L.B. Sukla and B.K. Mishra, *Korean Journal of Chemical Engineering*, Vol 31(3) (2014) 452-460. (Impact Factor: 2.476)
18. Behaviour of arsenic(III) and antimony(III) during electrowinning of nickel from aqueous sulphate solutions, R.R. Samal, **C.K. Sarangi**, B.C. Tripathy**,** K. Sanjay, I.N. Bhattacharya, T. Subbaiah, *Hydrometallurgy*, Vol 139 (2013) 39-45. (Impact Factor: 3.465)
19. The effects of magnafloc and zinc on electrowinning of cadmium in sulfate solutions, A. Biswal, K. Padhy, **C.K. Sarangi,** B.C. Tripathy, I.N. Bhattacharya and T. Subbaiah, *Hydrometallurgy*, Vol 117-118 (2012) 13-17. (Impact Factor: 3.465)
20. An evaluation of cadmium sorption potential of waste aluminium dross, **Chinmaya Kumar Sarangi**, Naba Kumar Sahu, Bankim Chandra Tripathy and Indra Narayan Bhattacharya, *Desalination and water treatment*, Vol 50 (2012) 360-366. (Impact Factor: 1.234)
21. Bio-hydrometallurgical processing of low grade chalcopyrite for the recovery of copper metal, S. Panda, **C.K. Sarangi**, N. Pradhan, T. Subbaiah, L.B. Sukla, B.K. Mishra, G.L. Bhatoa, M.S.R. Prasad and S.K. Ray, *Korean Journal of Chemical Engineering*, Vol 29 (2012) 781–785. (Impact Factor: 2.476)
22. Electrowinning of zinc from sulphate solutions in the presence of perfluoroglutaric acid, **C.K. Sarangi**, B.C. Tripathy, I.N. Bhattacharya, T. Subbaiah, S.C. Das and B.K. Mishra, *Minerals Engineering*, Vol 22 (2009) 1266-1269. (Impact Factor: 3.315)

Publications in Proceedings of Conferences/ Symposia/ Seminars

1. Processing of hydrometallurgical process liquors or effluents for the production of metals and chemicals, *National Metallurgist's Day (NMD),* 11-14 November, 2016, Indian Institute of Technology, Kanpur, India.
2. Fluoride assisted acid leaching of NALCO fly ash, International Conference on Processing of Low Grade and Urban Ore (IC-LGO), 20-22 January, 2015, National metallurgical Laboratory, Jamshedpur, India.
3. Effect of urea on facet development of Fe-Co bimetallic oxides: Application as arsenic sensor, Indian Innovations in Materials Research: New Materials and processes (IIMR), 25-27 June, 2015, CGCRI, Kolkata, India.
4. Reactor and heap leaching studies of mixed copper ore, International Conference on Processing of Low Grade and Urban Ore (IC-LGO), 20-22 January, 2015, National metallurgical Laboratory, Jamshedpur, India.
5. Electrolytic splitting of ammonium sulphate for production of ammonia and sulphuric acid, International Conference on Emerging Materials and Processes(ICEMP), 26-28 February, 2014, Bhubaneswar, India.
6. Extraction and electrodeposition of palladium from simulated high level liquid waste using ionic liquid, International Conference on Emerging Materials and Processes (ICEMP), 26-28 February, 2014, Bhubaneswar, India.
7. Studies on aluminium hydroxide precipitation using urea as an additive,XIII International Seminar on Mineral Processing Technology (MPT), 10-12 December, 2013, Bhubaneswar, India.

Research Projects

1. Enhancement in alumina to caustic (A:C) ratio of spent Bayer liquor through electrochemical process for additional precipitation of gibbsite (Project Leader); CSIR and National Aluminium Company Limited (NALCO), Bhubaneswar.
2. Processing of secondary resources for the production of battery materials (Project Leader); CSIR-FTT
3. Extraction of tungsten values from Hutti gold mine tailings concentrate and scrap: process flow sheet development, bench scale studies and pilot scale testing (Co-PI); Defence Metallurgical Research Laboratory (DRDO), Hyderabad.
4. Engineering consultancy work for development of Electrolytic–Membrane process for conversion of effluent sodium sulphate solution to sodium hydroxide and sulphuric acid (Co-PI), Heavy Water Board (HWB) (DAE), Mumbai.
5. Technology transfer for cobalt manufacture (Co-PI); MIDHANI, Hyderabad
6. Recovery of Electrolytic Manganese Dioxide (EMD) from manganese ore: Process optimization for existing plant at MOIL, alternate process development and Basic Engineering Package preparation (Co-PI); MOIL, Nagpur
7. Evaluation of suitability of nano iron/iron oxide powders for energy and sensor applications (Co-PI); NMDC, Hyderabad
8. Cobalt technology from impure cobalt hydroxide: Process flowsheet development; MIDHANI, Hyderabad
9. Technology development (Extractive metallurgy) for Polymetallic nodules (PMN); Ministry of Earth Sciences, Govt. of India.
10. Recovery of alumina from fly ash – modifications and validation of flowsheet; NALCO

Projects successfully completed

	Title of the project	Funding agency
1	Development and design of diaphragm-less cells for electrolytic acid killing	IGCAR (DAE), Kalpakkam
2	Laboratory testing of copper oxide ore, Oman	Engineers India Ltd., New Delhi
3	Laboratory scale study on alumina trihydrate productivity using catalyst	NALCO, Bhubaneswar
4	Feasibility studies to recover Mn metal from low grade Mn ore	TATA Steel, Jamshedpur
5	Process scale-up and feasibility study for improving Mn/Fe ratio of low grade manganese ore	TATA Steel, Jamshedpur
6	Evaluation of design parameters for dewatering of manganese nodules	NIOT, Chennai
7	Fundamental electrochemical studies during electrolytic reduction of titanium dioxide to titanium	DMRL (DRDO), Hyderabad
8	Continuous solvent extraction tests for separation of Rare Element	Heavy Water Board (DAE), Mumbai
9	Waste to wealth through hydro and electrometallurgical processing route	CSIR, New Delhi
10	Preparation and characterization of EMD suitable for batteries from slurry containing Mn and Co	KIGAM, South Korea
11	Recovery of lead from anode slime	Hindalco Industries (Birla copper unit), Dahej
12	Basic engineering process package for recovery of tellurium powder and removal of lead from anode slime	Hindalco Industries (Birla copper unit), Dahej
13	Metallurgical test work on recovery of Cu from leach residue	M/s. Chandra Proteco Ltd., Silvassa, India
14	Recovery of copper from lean sulphide/chalcopyrite ore by bio-heap leaching technology followed by solvent extraction and electrowinning at Malanjkhand Copper Project	Hindustan Copper Limited, Malanjkhand
15	Smelting reduction of iron ores/fines by hydrogen plasma and elimination of CO_2 emission	Ministry of Steel, New Delhi
16	Recycling of Lithium ion batteries	Renault Nissan Technology, Chennai
17	An investigation on recovery of alumina in NALCO fly ash through pyro-hydrometallurgical/ bioprocessing methods	NALCO, Bhubaneswar
18	Recovery of nickel from refinery electrolyte	Hindalco Industries (Birla copper unit), Dahej
19	Recovery of copper from slag tailings through hydrometallurgical route	Hindalco Industries (Birla copper unit), Dahej
20	Recovery of Te from anode slimes	

Technology / Process / Know-how developed

Sl. No.	Title	Organization/Industry
1	Splitting of sodium sulphate bearing effluent through electrolytic-membrane process for the production of sodium hydroxide and sulphuric acid	Heavy Water Board (HWB) (DAE), Mumbai
2	Extraction of tungsten values from Hutti gold mine tailings concentrate and scrap	Defence Metallurgical Research Laboratory (DMRL) (DRDO), Hyderabad
3	Processing of spent Bayer liquor for the improvement in recovery of alumina tri-hydrate	National Aluminium Company Ltd. (NALCO), Bhubaneswar
4	Recovery of alumina and other value-added products from fly ash	National Aluminium Company Ltd. (NALCO), Bhubaneswar
5	Recovery of Pd from spent nuclear fuel effluent (HLLW) using ionic liquids	Indira Gandhi Centre for Atomic Research (IGCAR) (DAE), Kalpakkam
6	Recovery of Te, Cu and Pb from anode slimes	M/s Hindalco Industries Ltd., Dahej, Gujarat
7	Recovery of nickel from refinery electrolyte	M/s Hindalco Industries Ltd., Dahej, Gujarat
8	Co-extraction of Co metal and battery grade EMD from the slurry obtained from KIGAM	KIGAM, South Korea
9	Recovery of Cu from low grade copper oxide ore	EIL and M/s Mawarid Mining Company, Oman
10	Development and design of diaphragm-less cell for electrolytic-acid killing	Indira Gandhi Centre for Atomic Research (IGCAR) (DAE), Kalpakkam