RTC INSTITUTE OF TECHNOLOGY

Anandi, Ormanjhi, Ranchi – 835219, Jharkhand

Approved by AICTE, New Delhi & Govt. of Jharkhand and Affiliated to Jharkhand University of Technology, Ranchi

(ISO 9001:2015 CERTIFIED)

Department of SCH (Chemistry)

Dr. Benjamin Raj

Assistant Professor

PhD, Central University of Jharkhand

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Brief Profile

I, Dr. Benjamin Raj is an Assistant Professor in Chemistry with a Ph.D. from the Central University of Jharkhand, Ranchi. A persistent person with strong orientation on goal. I am a flexible person, conformable with working on my own or as a part of the team. I enjoy learning about new things and innovations. I particularly enjoy collaborating with professors and scientists from different disciplines to develop new skills and solve new challenges. I have research expertise includes nanomaterials, metal oxide nanoparticles, electrochemical energy storage, supercapacitors, Photocatalysis, corrosion inhibition, and lithium-ion battery recycling.

Other Roles

1. Deputy HOD
2. NBA co-ordinator

Areas of Interest

- Supercapacitors and advanced energy storage materials.
- Lithium-ion battery recycling and regeneration.
- Electrochemical sensors.
- Photocatalysis and environmental remediation.
- Corrosion inhibition.
- Two-dimensional functional materials.
- Sustainable materials and resource recovery

Subjects taught

Engineering Chemistry

Publications

i) International Refereed Indexed journals

- Development of SnO_2@rGO hybrid nanocomposites through complexometric approach for multi-dimensional electrochemical application.

Benjamin Raj, Ramesh Oraon, Mamata Mohapatra, Suddhasatwa Basu, Arun K. Padhy. Journal of Electrochemical Society. 167 (2020) 167518.

- Retrieving spent cathodes from Lithium-ion batteries through flourishing technologies.
  Benjamin Raj, Manoj Kumar Sahoo, Aleksandar Nikoloski, Pritam Singh, Suddhasatwa Basu, Mamata Mohapatra. https://doi.org/10.1002/batt.202200418.
- Futuristic direction for R&D challenges to develop 2D advanced materials-based supercapacitors.
  Benjamin Raj, Arun. K. Padhy, Suddhasatwa Basu, and Mamata Mohapatra. Journal of Electrochemical Society. 167 (13) (2020) 136501.

- N-doped ZnO: Efficient photocatalyst for decomposition of methylene blue.
  Benjamin Raj, Kishor Kumar Sahu, Mamata Mohapatra, and Arun Kumar Padhy.Recent Innovation in Chemical Engineering. 13 (4) (2020) 332-342.

- Unravelling for 1st timeElectrochemical Sensing of As (III) by 3D Cavitized Kagome type lattice.
  Priyanka Mukherjee, Benjamin Raj, A.K. Padhy, Kali Sanjay, Mamata Mohapatra, Suddhasatwa Basu. Journal of Electroanalytical chemistry.877 (2020) 114725.

- Simple and cost-effective sonochemical preparation of ternary NZnO–Mn_2O_3@rGO nanohybrid: a potential electrode material for supercapacitor and ammonia sensing.
  Benjamin Raj & Ramesh Oraon & Arun Kumar Padhy. Ionics. 25(7) 2019 3351-3362.

- Calcination strategy for scalable synthesis of pithecellobium type hierarchical dual-phase nanostructured Cu_xO to columnar self-assembling CuO and their electrochemical performances.
  Kishor Kumar Sahu, Benjamin Raj, Suddhasatwa Basu, and Mamata Mohapatra. ACS Omega. 6 (2021) 1108-1118.

- Sustainable approach for reclamation of graphite from spent lithium-ion batteries
  P. Perumal, Mamata Mohapatra, Benjamin Raj, and Suddhasatwa Basu, Journal of Physics Energy. 2022 (16) 1-35.

- Performance and future directions of transition metal sulphide-based electrode materials towards and supercapacitor/supercapattery.
  Arya Das, Benjamin Raj, Mamata Mohapatra, Shuang Ma Andersen and Suddhasatwa Basu. Wires Energy and Environment, doi: 10.1002/(ISSN)2041-840X

- Recycling and Regeneration of energy storage materials from spent Lithium-Ion Batteries (LIBs) through microwave leaching.

  Benjamin Raj, Manoj Kumar Sahoo, Smruti Sourav, Suddhasatwa Basu, Mamata Mohapatra. IONICS 2023(29), 4365-4377.*

- Scalable synthesis of ZrO_2 nanoparticles through imidazolic precursor and evaluation of its electrochemical performance. (Accepted in Chemistry Select)
  Benjamin Raj, Arun Kumar Padhy, Suddhasatwa Basu, Mamata Mohapatra.

- Energy storage investigation on regenerated graphite-metal oxide composites from end-of-life LIBs

and promising for closed-loop approach.

P.Perumal, Benjamin Raj, Suddhasatwa Basu, Mamata. Mohapatra. Journal of Physics and Chemistry Solids, 2023, 111648.

- Recent advances, challenges, and future road map in determination of trace As (III) via hybrid electroactive materials: A Review.

  Priyanka Mukherjee, Benjamin Raj, Utpal Adhikari, Mamata Mohapatra. Materials Research Bulletin. 2023, 112535.
- Growth of Ni loaded CdS in nanorods structure for photocatalytic and dye degradation applications under solar irradiation
  Vikash Kumar, Benjamin Raj, Parmeshwar Kommu, Sanjeet Kumar Paswan, Gajendra Prasad Singh. Nano Express. 2024, 015023.

ii) National Refereed Indexed journals

- **Facile Synthesis of Mn_2O_3 as an Electrode Material for Supercapacitor Application.**
  Benjamin Raj[1], Rekha Kumari[2], Guru Charan Sahu[2]*. J.Chemtracks 2025, 27(1) 9-18.

iii) International Conference

- International Conference on Nature Inspired Initiatives in Chemical Trends, IICT, Hyderabad (2016).
- International Conference on Frontiers in Chemical Sciences, Central University of Jharkhand (2017).

iv) National Conference

- 19th CRSI National Symposium in Chemistry, University of North Bengal (2016).
- 30th Annual Conference of Orissa Chemical Society, KIIT University (2016).
- 31st Annual Conference of Orissa Chemical Society (2017).
- 36th Annual National Conference of Indian Council of Chemists, Andhra University (2017) – Oral Presentation.

v) Book Chapter

- **Imidazole framework-based metal oxide nanoparticles photocatalyst: An approach towards amputation of organic pollutants from water. (Book chapter in Elsevier)**
  Benjamin Raj, Arun Kumar Padhy, Gajendra Prasad Singh, Ratan Kumar Dey, and Ramesh Oraon. Nano-Materials as Photocatalysts for Degradation of Environmental Pollutants. (2020) 173-193.
- **Supercapacitor Energy Storage Incorporating Conjugated Microporous Polymer**

B Raj, AK Padhy, A Dey, R Oraon, M Mohapatra,Organic Polymers in Energy-EnvironmentalApplications, 93-110

- **Cellulose-imidazole engineering hybrid materials/membrane for Energy storage. (Book Chapter)**
  Benjamin Raj, Mamata Mohapatra, Arun. K. Padhy,& Suddhasatwa Basu.

- **Perspective of organic based antimicrobial coating materials: Implication towards COVID-19.(Book Chapter)**
  Benjamin Raj, Mamata Mohapatra, Arun. K. Padhy
- **Physicochemical dependency of Biochar-based nano-phase composites derived through Ball milling for visionary energy storage applications.**

  Benjamin Raj1, P. Perumal1, Arun Kumar Padhy2, D. S. Rao1, Mamata Mohapatra1,3*
- **Optimistic technological approaches for sustainable energy storage devices/materials. (Book chapter Elsevier)**
  Benjamin Raj, Arya Das, Suddhasatwa Basu, Mamata Mohapatra

PATENT:

1. "Method for recovery of iron rich magnetic portions suitable for sinter/pellet plants from steel making process waste sludge and a system therefore"
2. "Development of ceramic materials and battery grade cathode from oxide based spent LIB Cathode material through a cost-effective mixed acid leaching: A process thereof"(Filed)
3. "AI based device for Battery Range Estimation in Autonomous Vehicles. (Filed)

FDP/Orientation Programme/Workshop/Seminars/Training Programme Attended

- Short-Term Course on Current Scenario in Nano and Functional Materials (NANO-FM 2017), Coimbatore Institute of Technology.
- Workshop on Referencing Tools, Central University of Jharkhand (2017).
- Research Methodology and LaTeX Learning Programme, Central University of Jharkhand (2018).
- Faculty Development Programme on Trends in Chemical Sciences: Challenges and Opportunities in the Coming Decade, Central University of Jharkhand (2020).
- Short-Term Course on Current Scenario in Nano and Functional Materials (NANO-FM 2017), Coimbatore Institute of Technology.

Extra-Curricular Activities

- Reviewer for Mineral Processing and Extractive Metallurgy.
- Reviewer for Physica Status Solidi B: Basic Solid State Physics.

- Reviewer for Journal of Environmental Chemical Engineering
- Guided 09 M.Sc. students.
- Research collaboration with scientists and researchers in interdisciplinary areas of Chemistry and Materials Science.
- Prof. G. Gopala Rao Centenary Commemorative Award (2017) for Best Oral Presentation in Analytical Chemistry.
- BRICS Young Scientist Forum 2022 recognition in the New Materials section.