Carbohydrates and Copper for Sustainable Catalysis, Health Care and Environment

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ABSTRACT:

Recently, humankind has utilized more harmful chemical compounds and generated toxic waste in the environment. The anthropogenic activities have prompted our quest for a substitute chemical process that complies with sustainable and green chemistry principles. Carbohydrate-based ionic liquids are now the most intriguing alternatives due to their intrinsic properties, which encompass low cost, significant abundance, non-toxicity, high biodegradability, and elevated water solubility. The applications of carbohydrate-derived ionic liquids in asymmetric synthesis and the development of cascade reactions have garnered little attention, despite the prospective use of carbohydrate-based chiral auxiliaries, catalysts, and reagents in this domain. Consequently, our group is endeavouring to discover and synthesize a unique class of sugar ionic liquids derived from natural sugars. In this context, nature-derived sugars and abundant copper-based enzymes are an alternative to conventional organic synthesis for use in sustainable catalysis, health care, and the environment.

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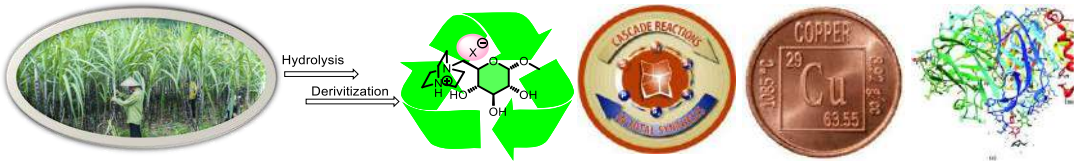

Scheme 1: Flow of my presentation

Keywords: Sustainable Organic Synthesis. Carbohydrates, Health care, Catalysis, and Copper-Sugar-Biocatalysis, Cascade reactions

References:

1. (a) Jyothylakshmi J. & **S. Rajasekhara Reddy*** Chemoenzymatic Relay Synthesis of Quinolines: Laccase/TEMPO/D-Glucose-Based Ionic Salt/atm O2-Catalyzed Chemoselective Oxidation of 2-Aminobenzyl Alcohols. ***ACS Sustain. Chem. Eng.*** **2026**, Accepted. https://doi.org/10.1021/acssuschemeng.5c10401 (b) Krishnaraj, P., & **S. Rajasekhara Reddy***. Sustainable d-glucose-based ibuprofen ionic liquids/salts for anti-inflammatory applications. *Bioorg. Chem*. **2025,** 165**,** 108956. (c) P, K., Sugumar, L. K., Sathi, B., Lin, C.-C., Wang, S., Tetala, K. K. R., & **S. Rajasekhara Reddy***. Sustainable relay strategy for the synthesis of d-glucose-based poly ionic liquid and its fabrication on carbon electrode for simultaneous detection of chromium (VI) and lead (II) in environmental waters. *Chem. Eng. J*., **2025**, **522**, 167488.

2. (a) **S. R. Reddy.** *et. al. Bioorganic Chemistry*. **2025**, 108553. https://doi.org/10.1016/j.bioorg.2025.108553. (b) Jyothylakshmi J and **S. R. Reddy** *Org. Biomol. Chem.* **2024**, 22, 8472 – 8479. (b) Krishnaraj P, Treesa M. C., Sathi B., C-C. Lin, and **S. R. Reddy.** *Asian J. Org. Chem***. 2024.** e202400202**.** (c). Victoria, G. G., Sanjivani Pal, Paranimuthu P., Harshil S. Bhatt, Sanjit Kumar, Lin Chun-Cheng, Sheng-kai Wang and **S. R. Reddy** *Chem. Biodiversity***, 2024**, **e202400719.** (d). Victoria, G. G, Harshil B., Paranimuthu P., Sanjivani pal, Sanjit Kumar, C-C. Lin, **S. R. Reddy** *ChemistrySelect* **2024**, 9, e202401348.

3. (a) P. Paranimuthu and **S. R. Reddy**, *Eur. J. Org. Chem.* **2023**, e202300430 (b) P. Paranimuthu, U. Vijayasree, J. Jyothylakshmi and **S. R. Reddy**, *Org. Biomol. Chem.* **2023**, *21*, 2632-2652. (c) Pooja, G and , S. R, Reddy, *Asian J. Org. Chem.* **2022,** *11, e202200322*. (d) G. Grace and S. R, Reddy,, *Appl Organomet Chem* **2022**, *36,* e6518. (e) **S. R. Reddy,** *et al., J. Org. Chem.* **2018**, *17*, 10241. (f) **S. R. Reddy,** *et al. J. Org. Chem***. 2019**, 84, 3036. (i) **S. R. Reddy,** *et al., Org. Lett.,* **2019**, *21,* 2256.

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Research Area: *Sustainable Organic Synthesis Applications to Health care and Societal Applications.*