

SUSTAINABLE INNOVATION: GREEN SYNTHESIS OF COPPER-ENRICHED ZIFs VIA A SOLVENT-FREE THERMAL ROUTE

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The pursuit of eco-friendly and scalable synthesis methods for advanced materials is revolutionizing modern catalysis. This study introduces an innovative in situ thermal (IST) approach for the solvent-free synthesis of copper-containing zeolitic imidazole frameworks (Cu-ZIF-8 and Cu-ZIF-67). By eliminating the use of solvents or additives, this method achieves high yields in a cost-effective and environmentally sustainable manner, making it an ideal candidate for large-scale production. A critical feature of the IST method is the multifunctionality of 2-methylimidazole, which acts as a solvent, hydrophilic agent, and ligand, driving the formation of highly crystalline frameworks. The thermal process effectively removes residual byproducts, ensuring the purity of the material without requiring additional activation or purification steps. The resulting Cu/ZIFs exhibit exceptional porosity, thermal stability, and catalytic activity, positioning them as versatile materials for industrial applications. The catalytic efficiency of Cu-ZIF-8 and Cu-ZIF-67 was demonstrated in the Azide-Alkyne Cycloaddition (AAC) reaction, a cornerstone of click chemistry. Both catalysts delivered high yields and selectivity using water as a green solvent, showcasing their potential as sustainable alternatives for synthetic transformations. This work underscores the IST approach as a transformative method for synthesizing metal-organic frameworks (MOFs), aligning with the principles of green chemistry while addressing scalability and cost-effectiveness. These findings highlight a pathway to designing high-performance catalysts with far-reaching applications in material science, environmental remediation, and sustainable chemistry [1].

[1] Anbari, A.P., et al., Green Approach for Synthesizing Copper-Containing ZIFs as Efficient Catalysts for Click Chemistry. *Catalysts*, 2023. 13(6): p. 1003.