Ni-Co bimetallic metal organic framework: a promising catalyst for the chemical fixation of CO_2 via cyclic carbonate synthesis

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Efficient strategies for the reduction of greenhouse gas emissions, primarily CO_2, are needed. Thus, the development of CO_2 capture and sequestration/storage (CCS) technologies that involve catalyst-mediated reactions such as CO_2 capture, transportation, and storage is essential. MOFs are a new and emerging class of porous material that have been dynamically investigated as catalysts for the synthesis of cyclic carbonates owing to its greater CO_2 affinity. Herein, the aqueous synthesis of a bimetallic metal organic framework (MOF) with Ni and Co as the active metal centers and benzene-1,4-dicarboxylic acid as a linker has been achieved rapidly in high yield using microwave irradiation. The synthesized MOF is investigated for its catalytic efficacy in the synthesis of cyclic carbonates from epoxides and CO2. The Ni-Co-MOF provides high conversion rates of epoxides to cyclic carbonates with >99% selectivity under solvent-free conditions. Finally, a plausible reaction mechanism for Ni-Co-MOF-catalyzed epoxide-CO_2 cycloaddition reactions based on charge transfer is also proposed.