Aluminum-based MOF catalyst with V-shaped linker for the CO_2 fixation via cyclic carbonate synthesis

김가형, Francis Kurisingal Jintu[1], 최영선[1], 박대원[1,†]
부산대학교; [1]부산대
(dwpark@pusan.ac.kr†)

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 have been found to be highly efficient in catalyzing the epoxide-CO_2 transformation in the presence of nucleophilic co-catalysts. In this work, we report the catalytic efficiency of aluminium based MOFs, denoted [Al(OH)(H_2DPSTC)]0.5H_2O (CAU-11-COOH). The catalysts based on Al^{3+} ion and 3,3',4,4'-diphenylsulfonetetracarboxylic dianhydride ligands to form a 2D highly porous framework. The catalyst was characterized using various techniques, including XRD, FT-IR, TGA, XPS, FE-SEM, and BET analysis. The [Al(OH)(H_2DPSTC)]0.5H_2O MOF provides high conversion rates of epichlorohydrin to epichlorohydrin carbonates with >99% selectivity under solvent-free conditions. The roles of parameters such as temperature, pressure, time and amount of loaded catalyst were performed and a plausible reaction mechanism was suggested. Keywords: [Al(OH)(H_2DPSTC)]0.5H_2O, CO_2, epoxide, cyclic carbonate.