

Sonochemical synthesis of aluminum fumarate metal-organic framework for CO<sub>2</sub> cycloaddition to epichlorohydrin임용현, 김현섭, 김도희, 안화승<sup>1,†</sup>서울대학교; <sup>1</sup>인하대학교(whasahn@inha.ac.kr<sup>†</sup>)

Aluminum fumarate was tested as a catalyst for CO<sub>2</sub> cycloaddition to epichlorohydrin under solvent-free reaction conditions. This material was synthesized hydrothermally via a sonochemical route (Al fumarate-(S)), which exhibited a higher catalytic activity than Al fumarate synthesized by a conventional method owing to the higher number of Lewis acid sites formed in Al fumarate-(S). The CO<sub>2</sub> uptake of Al fumarate-(S) was high: approximately 269 mg g<sup>-1</sup> at 25 °C and 10 bar. High conversion (96%) of epichlorohydrin with excellent selectivity (97%) to cyclic carbonate was obtained at 50 °C and 10 bar CO<sub>2</sub> after 6 h of reaction. The kinetic analysis of the reaction confirmed an approximately 1st order dependence on the epichlorohydrin concentration and CO<sub>2</sub> pressure with an activation energy of approximately 39 kJ mol<sup>-1</sup>. The recovered Al fumarate-(S) catalyst, however, showed a steady decline in catalytic activity during the recycling runs, as reported for other metal-organic framework catalysts. The deactivation was monitored by N<sub>2</sub> adsorption-desorption isotherms and spectroscopic analyses.