

Synthesis of Adipic Acid through Oxidation of K/A oil and Its Kinetic Study in a Microreactor System

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Abstract

Synthesis of adipic acid (AA) through the oxidation of cyclohexanol and cyclohexanone (K/A oil) with nitric acid was conducted in a capillary microreactor system. Effects of the temperature, the nitric acid concentration, the volumetric flow rate ratio of nitric acid to K/A oil, and the capillary length on the selectivity and the product yield were investigated systematically to achieve optimal reaction conditions. Notably, a high yield of adipic acid (i.e., 90%) was achieved just in 6 seconds at 85 with the use of 55 wt% nitric acid. Gas components produced in this oxidation process and its total volumetric flow rate were determined under various operating conditions, which was beneficial for reaction mechanism characterization and process optimization. Finally, a kinetic model was established, which was of crucial theoretical significance and practical value for optimizing the reactor design and better understanding such fast and highly exothermic multiphase processes with abundant gas production.

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