

Lime Addition–Capacitive Deionization(CDI) Hybrid Process for the Removal of Acetic Acid and Sulfuric Acid from Biomass Hydrolyzate

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In this study, we developed a lime addition–capacitive deionization (CDI) hybrid process that can efficiently remove acetic acid and sulfuric acid from the model mixture of glucose, xylose, acetic acid, and sulfuric acid, which are the major components from the biomass hydrolyzate by acid hydrolysis. The key parameters of lime addition process (type of lime, amount of lime, stirrer speed, reaction time) and CDI process (voltage, flow rate, feed concentration) were also optimized. In the lime addition process, the optimal lime type, acids(sulfuric acid and acetic acid)/lime molar ratio, stirrer speed, and reaction time for removal of sulfuric acid were CaCO_3 , 1:1, 200 rpm, and 6 min, respectively. For the CDI process, the optimal voltage and flow rate were 1.2 V and 20 mL/min. The efficiency of acid removal increased as the initial acetic acid concentration decreased. The developed hybrid process was able to remove 98.08% of sulfuric acid and 76.97% of acetic acid from the mixture of glucose, xylose, acetic acid, and sulfuric acid. It was able to recover most of the sugar (>99%) at high purity (97.53%).