A Novel Process for the Removal of Acetic Acid and Sulfuric Acid from Biomass Hydrolyzate

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In this study, we developed an efficient lime addition-capacitive deionization (CDI) hybrid process that can recover sugar from the mixture of glucose, xylose, acetic acid, and sulfuric acid, which are the major components of biomass hydrolyzate. It also optimized the key parameters of the lime addition process (type of lime, amount of lime, stirrer speed, reaction time) and of the CDI process (voltage, flow rate, feed concentration). 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, 500 rpm, and 8 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 98.1% of sulfuric acid and 77.0% 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 (97.5%).