E408

Synthesis of Lactic Acid by Alkaline Hydrothermal Conversion

Anna Pocsai ; Pablo J. Arauzo ; Andrea Kruse
Hungarian University of Agriculture and Life Sciences Institue of Bioengineering and Process Engineering; Conversion Technologies of Biobased Resources, University of Hohenheim

The synthesis of lactic acid from glucose by alkaline hydrothermal conversion (HC) is proposed. HC is a thermochemical conversion process, which takes place in aqueous medium, and operates on relatively low temperature (180 -260 °C) and autogenous pressure. It generates primary hydrochar from biomasses and sugars, and as byproducts organic acids, furanic compounds, phenolic substances are produced. Among these substances, lactic acid is a result of interest as a versatile intermediate for the synthesis in pharmaceutical, biochemical, chemical industries. In this work HC is optimized for lactic acid production with alkaline media as catalyst. For this purpose, temperature (160-220°C), effect of Ca(OH)2 and NaOH catalyst and reaction time (0-20 minutes) have been studied as variables. Statistical analysis by response surface methodology showed significant effect of all factors, the effects were quantified by a reduced cubic model. The optimal lactic acid yield obtained was 32.58±0.0849 % by Ca(OH)2, at 190°C, after heating up the reactor, and 20.90±0.91 by NaOH after 20 minutes residence time. In order to monitor possible side reactions and additional degradation products, a byproduct analysis was carried out by HPLC. From this analysis it can be assumed that noncatalytic conditions favour glucose-fructose isomerization and dehydration of fructose into hydroxymethylfurfural. In the presence of alkaline media carbon bond breaking of glucose into aldehydes (glyceraldehyde, pyruvaldehyde) was promoted, which aldehydes are the intermediates of lactic acid synthesis during hydrothermal conversion. As a result, a selective lactic acid production could be obtained with a relatively high yield.