Hydrothermal Catalytic Conversion of Macroalgae-derived Alginate to Furfural and Organic Acids

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The marine biomass including micro- and macroalgae is gaining great attention as a promising renewable source for production of valuable chemicals. Alginate, a main carbohydrate compound of macroalgae, is composed of mannuronic acid and guluronic acid via 1,4-glycosidic linkages. Based on the cellulose-like structure, the alginate can be utilized as a carbohydrate feedstock in hydrothermal treatment processes. In our work, the hydrothermal treatment of sodium alginate was performed over various types of catalysts in subcritical water in order to investigate the effects of catalysts on alginate depolymerisation and organic acid production. Over acid catalysts, the acid-catalysed hydrothermal decomposition of alginate enhanced the production of monomers, glycolic acid and furfural. In contrast, over base catalysts, the lactic acid and dicarboxylic acids were predominantly produced by the base-catalysed reaction. Heterogeneous and homogeneous acid and base catalysts were employed in the hydrothermal reaction in order to evaluate the catalytic performance and study the relevance between the catalyst properties and activities.