

**Strategies and demonstration of producing fermentable metabolites from marine macroalgal biomass for producing fuels and chemicals**

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Brown macroalgae have received much attention as one of promising renewable biomass feedstocks. Brown seaweed is composed of complex polysaccharides mainly such as alginate. Alginate lyases are the main enzymes to degrade alginate into monomers, and these enzymes occur in many marine bacteria. Alginate lyases are known to degrade alginate into smaller molecules by a  $\beta$ -elimination reaction. Here, we cloned two alginate lyase genes of endo- and exo-type enzymes from a marine bacterium that exhibited strong and diverse degrading activity towards complex polysaccharides including alginate. The combined use of these two enzymes for alginate successfully produced monomeric sugar acids from alginate. The further conversion of the monomeric sugar acids to fermentable metabolites could enable biofuels and chemicals synthesis from alginate from brown macroalgal biomass.