

### Design and preparation of Cu/Zn/Al catalysts using the modified co-precipitation method for the bio-alcohol production

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Because of their possibly easier processibility compared with lignocellulose, seaweeds are promising biomass resources to produce biofuels and biochemicals. Seaweeds can be fermented to a mixture of organic acids and then further converted by catalytic hydrogenolysis to alcohols. Cu/Zn/Al catalysts are frequently used for the methanol reforming process in addition to the hydrogenolysis reaction. While the conventional co-precipitation method has been used to prepare highly dispersed Cu nanoparticle catalysts, the modified co-precipitation method is developed in order to fabricate the more highly dispersed Cu nanoparticles. Various catalysts were prepared using different conditions, and their catalytic activity and stability were observed using a continuous flow reactor. The prepared catalysts were observed with XRD to confirm the formation of favored precursor complex and their Cu surface area was measured using N<sub>2</sub>O-chemisorption. BET surface area and pore structures were determined using N<sub>2</sub>-physisorption, furthermore, TG-DTA, SEM and TEM were also used as tools to understand the relations between catalytic activity and catalyst properties.