

PA23) Gold/Copper Bi-Metallic Catalysts by Carbothermal Method for CO₂ Reduction

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Abstract

Increasing the CO₂ concentration in the atmosphere induce high temperature and rising sea levels. So the technology that capture and reuse of the CO₂ have been recently become popular. Among other methods, CRR(CO₂ reduction reaction) is typical method of CO₂ reusing. Electrocatalyst can show more higher efficiencies in CRR than photocatalyst because it doesn't use nature source. Nowadays, finding high efficient electrocatalyst by controlling electronic (affected by stoichiometry) and geometric (affected by atomic arrangement) factors are very important issues.

Mono-atomic electro-catalyst has limitations on controlling binding energy because each intermediate has own binding energy range. So the Multi-metallic electro-catalyst is important to stabilize intermediate at the same time. Carbon monoxide(CO) which is our target product and important feedstock of useful products. Au is known for the most high CO production metal. With copper, Not only gold/copper has advantages which is they have FCC packing for easily forming solid solution regardless of stoichiometry but also presence of adsorbed CO on Cu promotes the desorption of CO on Au because of strong repulsion. And gold/copper bi-metal catalyst can show high catalytic activity(mass activity) although it has low selectivity relatively Gold.

Actually, multi-metallic catalyst structure control method is limited in the solution method which is takes a lot of time. In here, we introduce CTS(carbo thermal shock) method which is using heat to make MMNP in a few seconds for making gold-copper system. This method is very simple and efficient in terms of time(very short reaction time and using carbon substrate as a direct working electrode) and increasing reaction sites(highly dispersed and mixing alloy structures). Last one is easy to control degree of mixing and it can induce 5 or more metals in one alloy system.

Gold/copper by CTS can show higher catalytic activity depending on metal ratio which is altered easily by changing simple variables.

The ultimate goals are making CO₂ test system by CTS which can check the selectivity depending on metal types in a very short time.