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Role of zinc in production of hydrogen in partial oxidation of methanol over CeO_2-ZrO_2 catalyst

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Hydrogen can be regarded as future zero emission energy carrier and partial oxidation of methanol was most promising for hydrogen production, because of thermodynamically promising compared to steam reforming and lower CO selectivity compared to methanol decomposition reaction. Partial oxidation of methanol (POM) over many catalysts have been studied for hydrogen production and this hydrogen can be used as fuel for the fuel cell vehicles in the future, this was regarded to be the best solution for minimizing the carbon emission in the atmosphere, reduces the overdependence of oil and as well as cost-effective way for future applications. In this study promotion effects of transition metals over gold-based ceria-zirconia mixed catalysts and ceria-zirconia, mixed catalysts have been studied for methanol partial oxidation reaction. Fe, Co, Cu and Zn were studied and Fe, Co and Cu were used as a comparison, among these transition metals, Zn presented CeO_2-ZrO_2 catalyst for POM reaction gives a high yield of hydrogen and selectivity and low selectivity towards to CO formation. To further study effects of Zn effects on CeO_2-ZrO_2, Zn metal have varied from 0.1wt.% to 30wt.% of the catalyst composition. Catalyst property was characterized by XRF, XRD, H_2-TPR, XPS, TEM and N_2 adsorption. The activity results show that the catalyst containing an optimal weight percentage of Zn promoted catalyst shows very high hydrogen selectivity and the highest activity among the tested catalysts. The optimal working temperature established was 375-400°C and at this temperature range highest hydrogen and lowest CO selectivity was registered. The reducible mixed oxide carriers contained Zn metals shows excellent catalytic performance and shows promising future applications.

Biography

Aibibula Bake has graduated from Tongji University with majoring in Chemical Engineering and Technology in 2012. After completing Bachelor study, he has continued further study in Master (from Sep 2012 to May 2015). In the Master study, he has studied transition metals and gold based ceria-zirconia catalysts for hydrogen production via partial oxidation of methanol reaction. From his Master study had published many journal articles and one US patent. Between June 2015 to October 2018, he has worked in the private sector for three years. He is going to join as a PhD candidate for Sojo University in mid of October 2018.

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