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Preparation and characterization of Cu-Zn-V-Al oxides catalyst in auto thermal reforming of methanol

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Hydrogen production via steam reforming of methanol (SRM) using commercial methanol synthesis catalyst, co-precipitated Cu-Zn-Al oxide, had mostly been studied as a promising solution for fuel cell vehicle application. However the problem of high CO formation (≥20ppm) and high external energy input to the endothermic reaction has yet to be improved. To overcome this, the exothermic partial oxidation of methanol (POM) that also produces hydrogen had been added by adding oxygen (air) as the substrate along with methanol and water and this combination termed as the auto thermal reforming of methanol (ATRM). Vanadia is a potential catalyst promoter to catalyze the POM since it has good track record as a commercial moderate oxidizing catalyst in oil, gas and petrochemical industries for the dehydrogenation and partial oxidation of hydrocarbon and alcohol. The vanadia-promoted Cu-Zn-Al oxides catalysts were prepared (co-precipitation method) by referring to the metal ratio as designed in an experimental design (mixture design) prior to be characterized by using X-Ray Diffraction (XRD), Brunauer-Emmett-Teller (BET), Temperature Programmed Reduction (TPR) and Scanning Electron Micrograph with Energy Dispersive X-Ray (SEM-EDX) method. Then the calcined catalysts were tested catalyzing the SRM and ATRM reaction within the temperature range 150 → 300^{o}C by using tubular micro reactor. The result of the reaction, and BET and TPR characterization were presented and optimized in the form of surface function verses the factor of the metal ratio on the design of the simplex centroid triangle.