Hydrogen production by steam reforming of methanol in a micro-channel reactor

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Hydrogen production by steam reforming of methanol was studied over Cu/Zn-based catalysts. Cu/Zn-based catalysts were derived from hydrotalcite-like precursors prepared by co-precipitation method. The catalysts were characterized by N_2O chemisorption, XRD, and BET surface area measurements. It was revealed that ZrO_2 added to Cu/Zn-based catalyst favorably served in enhancing copper dispersion on the catalyst surface. Among the catalysts tested, Cu/ZnO/ZrO_2/Al2O_3 catalyst exhibited the highest methanol conversion and the lowest CO concentration in the outlet gas. A micro-channel reactor coated with Cu/ZnO/ZrO2/Al_2O_3 catalyst in the presence of undercoated Al_2O_3 buffer layer showed higher methanol conversion and lower CO concentration in the outlet gas than that in the absence of undercoated Al_2O_3 buffer layer. The micro-channel reactor with undercoated Al_2O_3 buffer layer produced large amounts of hydrogen compared to the one without buffer layer. The undercoated Al2O3 buffer layer enhanced the adhesion between catalysts and micro-channel walls, leading to improvement of reactor performance.