Conversion of biomass-derived syngas to methanol and dimethyl ether on coprecipitated Cu-ZnO-Al_2O_3

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The biomass-derived syngas would provide a beneficial route for MeOH and DME synthesis because biomass is expected to be a renewable energy source to reduce CO_2 emissions in the future. However, the syngas obtained from biomass gasification is not a suitable feed to be used directly for the current DME production technology because it has H_2-deficient and CO_2-abundant composition. The objectives of this study is to develop active and stable hybrid catalysts for the conversion of biomass-derived syngas to MeOH and DME. The hybrid Cu-ZnO-Al_2O_3 catalysts were prepared by coprecipitation method with varying aging time from 1 to 9 h. In the variation of aging time from 1 to 9 h in the coprecipitation procedure, the optimum aging time was 6 h to provide enhanced yield for the formation of MeOH and DME and minimized CO_2 formation. BET surface area and TPR results indicate that the dispersion of Cu-ZnO-Al_2O_3 particles is affected by the aging time and reaches the maximum at 6 h. The improved catalytic performance is likely owing to higher dispersion and smaller size of Cu-ZnO-Al_2O_3.