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Correlating Ultrasonic Impulse and Addition of ZnO Promoter with CO_2 Conversion and Methanol Selectivity of CuO/ZrO_2 Catalysts

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Abstract

The thermal characteristics of Cu-based catalysts for CO_2 utilization towards the synthesis of methanol were analysed and discussed in this study. The preparation process were varied by adopting ultrasonic irradiation at various impulses for the co-precipitation route and also, by introducing ZnO promoters using the solid-state reaction route. Prepared catalysts were characterised using XRD, TPR, TPD, SEM, BET and TG-DTA-DSC. In addition, the CO_2 conversion and CH_3OH selectivity of these samples were assessed. Calcination of the catalysts facilitated the interaction of the Cu catalyst with the respective support bolstering the thermal stability of the catalysts. The characterisation analysis clearly reveals that the thermal performance of the catalysts was directly related to the sonication impulse and heating rate. Surface morphology and chemistry was enhanced with the aid of sonication and introduction of promoters. However, the impact of the promoter outweighs that of the sonication process. CO_2 conversion and methanol selectivity showed a significant improvement with a 270% increase in methanol yield.

Keywords: *Carbon dioxide, Thermal stability, Hydrogenation, Catalysts, Methanol synthesis.*

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