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ARTICLE

Structure-Activity Relationships of Cu-ZrO_2 Catalysts for CO_2 Hydrogenation to Methanol: Interaction Effects and Reaction Mechanism

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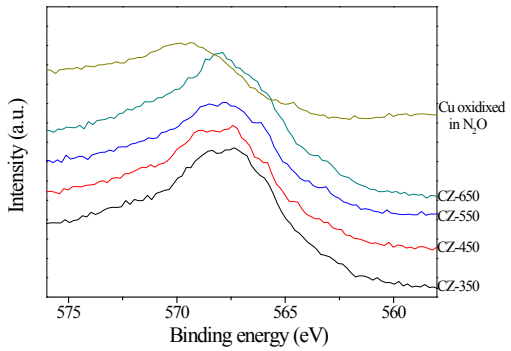

Figure S1. The change in the Cu L3VV Auger line for the reduced CZ catalyst and Cu oxidixed in N_2O

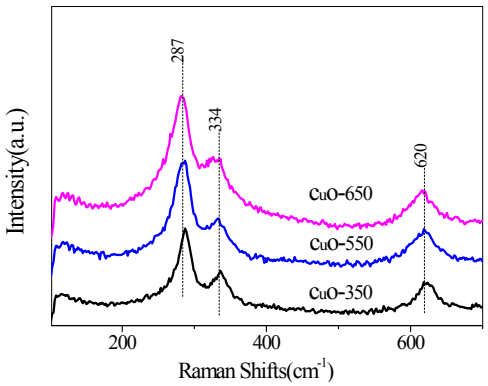

Figure S2. Raman spectra of various CuO calcinated at 350, 550 and 650 °C.

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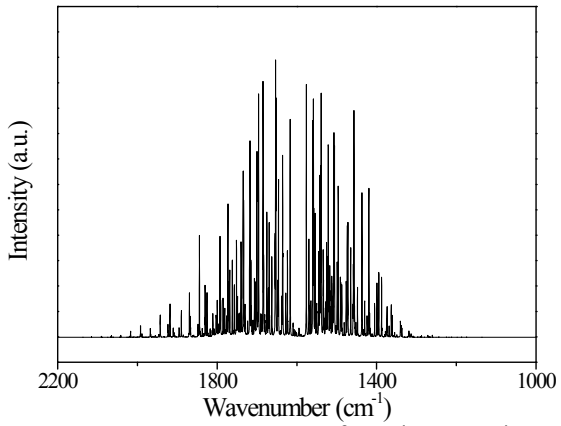

Figure S3. In situ DRIFT spectra of H_2O (1000ppm)

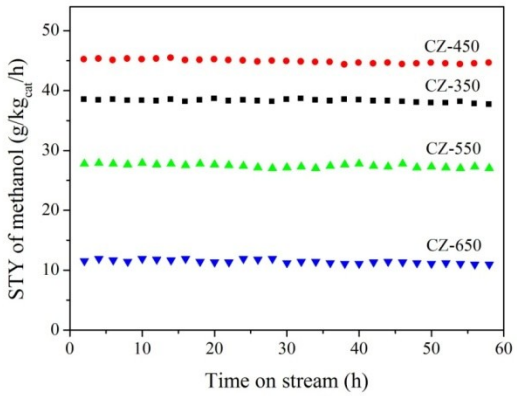

Figure S4. Space-time yield (STY) of methanol as a function of time-on-stream over CZ-350, CZ-450, CZ-550 and CZ-650. Reaction conditions: T=220 °C, CO_2:H_2=1:3, P=3.0 MPa, GHSV=3600 h^{-1}.

Stability is a key factor in determining whether the Cu/ZrO_2 materials can be used as methanol synthesis catalyst for CO_2 hydrogenation reaction in industrial production. Figure S4 shows the STY versus the time-on-stream of methanol over four catalysts: CZ-350, CZ-450, CZ-550 and CZ-650. It was found that the STY for methanol decreased by less than 3% from its initially stabilized values. It was obvious that the CZ catalysts exhibited a stable catalytic performance for the whole test period.