

## Linear $\alpha$ -olefin production from CO and CO<sub>2</sub> over zinc ferrite catalysts: effect of Na- and K-promoters

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The Paris Agreement on reducing greenhouse gases has drawn a lot of attention in carbon capture and utilization (CCU). Carbon dioxide can be transformed into oxygenates and hydrocarbons through hydrogenation, where a reverse water gas shift (rWGS) is followed by a Fischer-Tropsch (FTS) reaction. We could convert CO<sub>2</sub> into linear  $\alpha$ -olefins ( $\alpha$ -olefins), which is one of valuable chemical intermediates. Iron based catalysts are typically known to be active in both rWGS and FTS reaction. Composition of iron species is important in determining the overall catalytic performance, where alkali metals can act as a promoter for each reaction.

In this study, we hypothesize that alkali metals affect the reaction rates of CO and CO<sub>2</sub> differently. To elucidate this, we synthesized Na- and K-added zinc ferrite catalysts and measured different reaction rates with H<sub>2</sub> to CO and CO<sub>2</sub> ratio (H<sub>2</sub>/(CO+CO<sub>2</sub>)) and CO to CO<sub>2</sub> ratio (CO/CO<sub>2</sub>). We have obtained a maximum  $\alpha$ -olefin selectivity (51.5 %) in the range C<sub>2</sub>-C<sub>3,2</sub> at 63.6% CO conversion and 23.6% CO<sub>2</sub> conversion at 340 °C and 2.0 MPa for 200 hours continuous reaction.