

Direct conversion of CO<sub>2</sub> to hydrocarbons over bifunctional spinel oxide catalysts

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Hydrogenative direct conversion of CO<sub>2</sub> to hydrocarbons by the combination of CuAl<sub>2</sub>O<sub>4</sub> and iron oxide as reverse water-gas shift (RWGS) and Fischer-Tropsch (FT) catalyst, respectively, was investigated by supporting iron oxide on CuAl<sub>2</sub>O<sub>4</sub> (i.e., Fe/CuAl<sub>2</sub>O<sub>4</sub>). This integrated catalyst enabled the direct conversion of CO<sub>2</sub> to large molecular weight hydrocarbons, which might occur via consecutive pathways of RWGS (CO<sub>2</sub> to CO) and FT (CO to hydrocarbons). The loading of iron oxide and the effect of alkali promoter have been investigated in this reaction. The higher the loading of iron oxide, the higher the CO<sub>2</sub> conversion and C<sub>2+</sub> hydrocarbon selectivity. The introduction of potassium into Fe/CuAl<sub>2</sub>O<sub>4</sub> catalyst significantly promoted selectivity for long-chained hydrocarbons in the range of C<sub>5</sub> ~ C<sub>12</sub> with high selectivity, and the CH<sub>4</sub> formation was suppressed at the same time. Depending on the composition of bifunctional spinel oxide catalysts, the C<sub>2+</sub> hydrocarbon yield can increase up to 41.9%.