

# Magnetic Properties of Iron-based Catalysts Activated by Various CO<sub>2</sub> Concentrations

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Fresh catalyst samples of 100Fe/5.26Cu/4.76K/18.2SiO<sub>2</sub> in part per weight were synthesized by using a combination of a co-precipitation technique and spray-drying method and were activated in situ by using syngas (H<sub>2</sub>/CO/xCO<sub>2</sub>) with different amounts of CO<sub>2</sub> ( $x = 0.0, 0.5, 1.0, \text{ and } 2.0$ ). All activated catalyst samples showed similar XRD patterns, a combination of ferrihydrite, magnetite,  $\chi$ -carbide, and  $\varepsilon'$ -carbide, regardless of the CO<sub>2</sub> contents. From the Mössbauer spectra, we also observed a combination of ferrihydrite, magnetite,  $\chi$ -carbide, and  $\varepsilon'$ -carbide in all activated catalyst samples. The main compound of the activated catalyst sample activated by using CO<sub>2</sub>-free syngas (H<sub>2</sub>/CO) was magnetic  $\chi$ -carbide, and the main compound changed from  $\chi$ -carbide to ferrihydrite with increasing CO<sub>2</sub> concentration, confirmed by both, Mössbauer spectra and XRD pattern.

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