

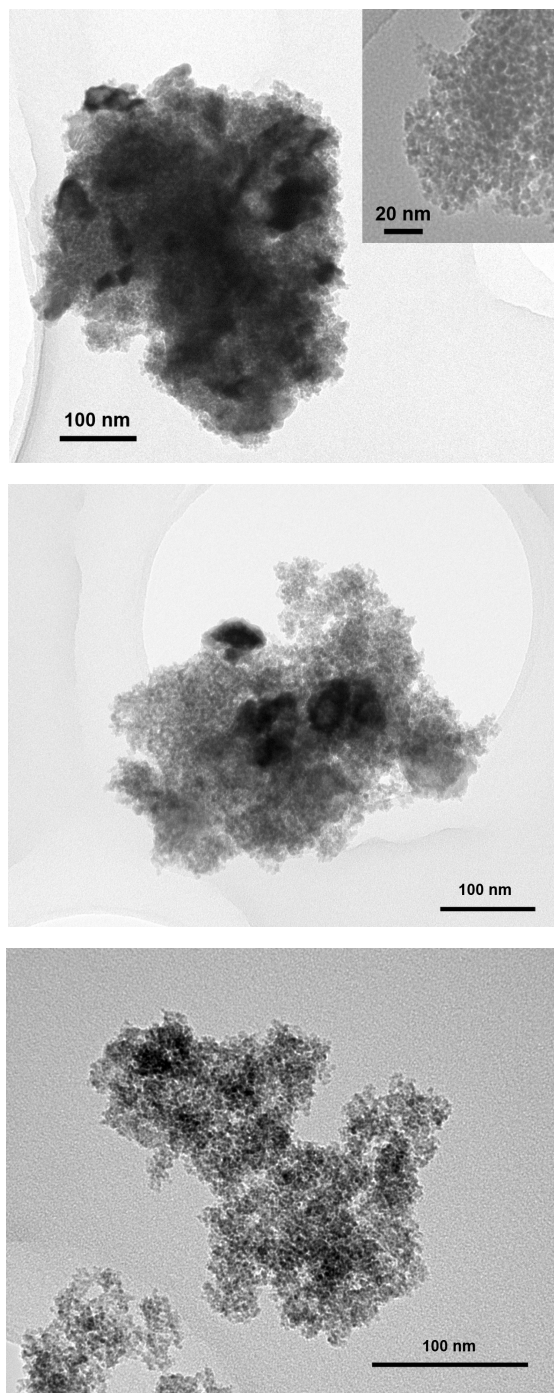
## Electronic Supplementary Information (ESI) for:

### The role of Cu on the reduction behavior and surface properties of Fe-based Fischer-Tropsch catalysts

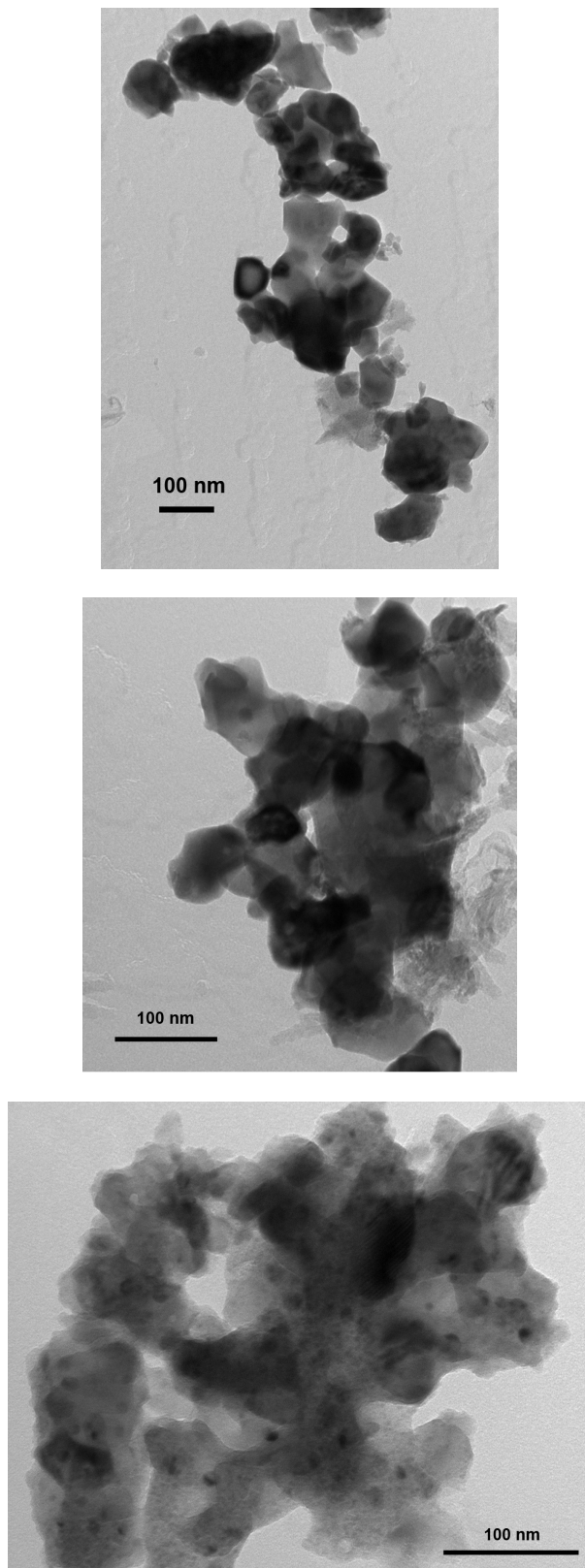
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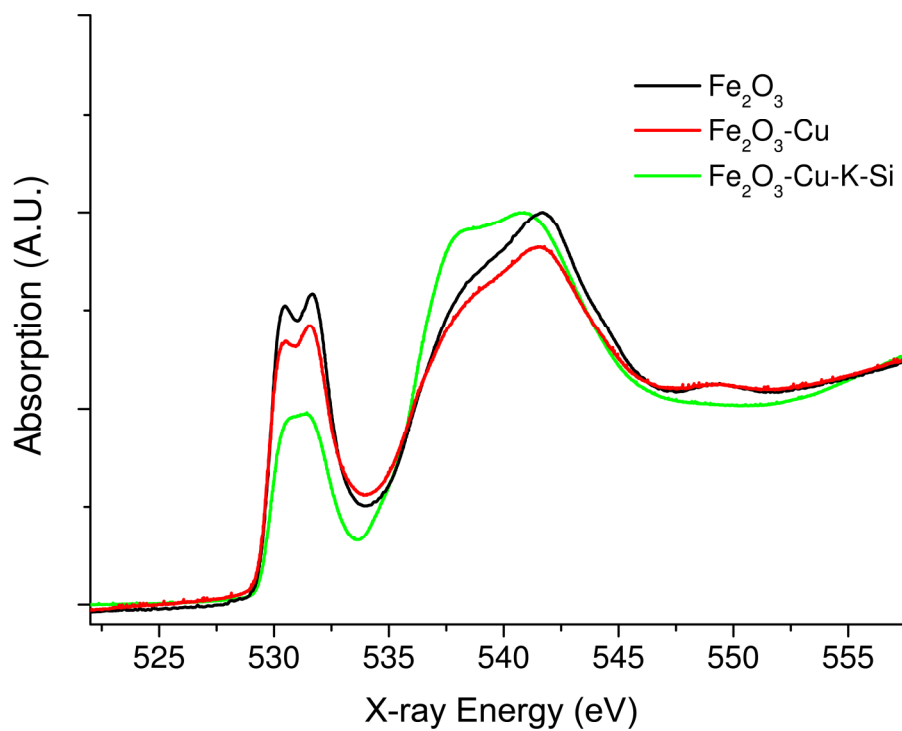
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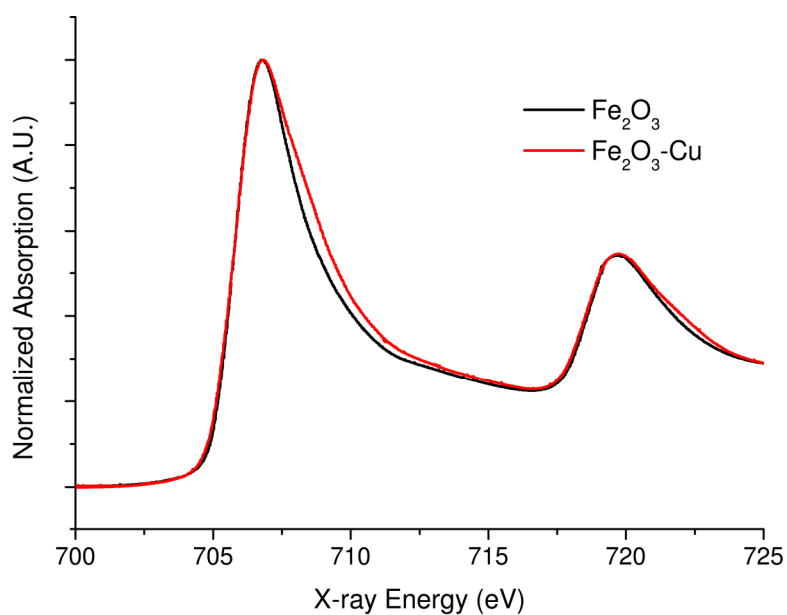
**Fig. E1** Representative TEM images of the Fe<sub>2</sub>O<sub>3</sub> (top), Fe<sub>2</sub>O<sub>3</sub>-Cu (middle) and Fe<sub>2</sub>O<sub>3</sub>-Cu-K-Si (bottom) materials before treatment.



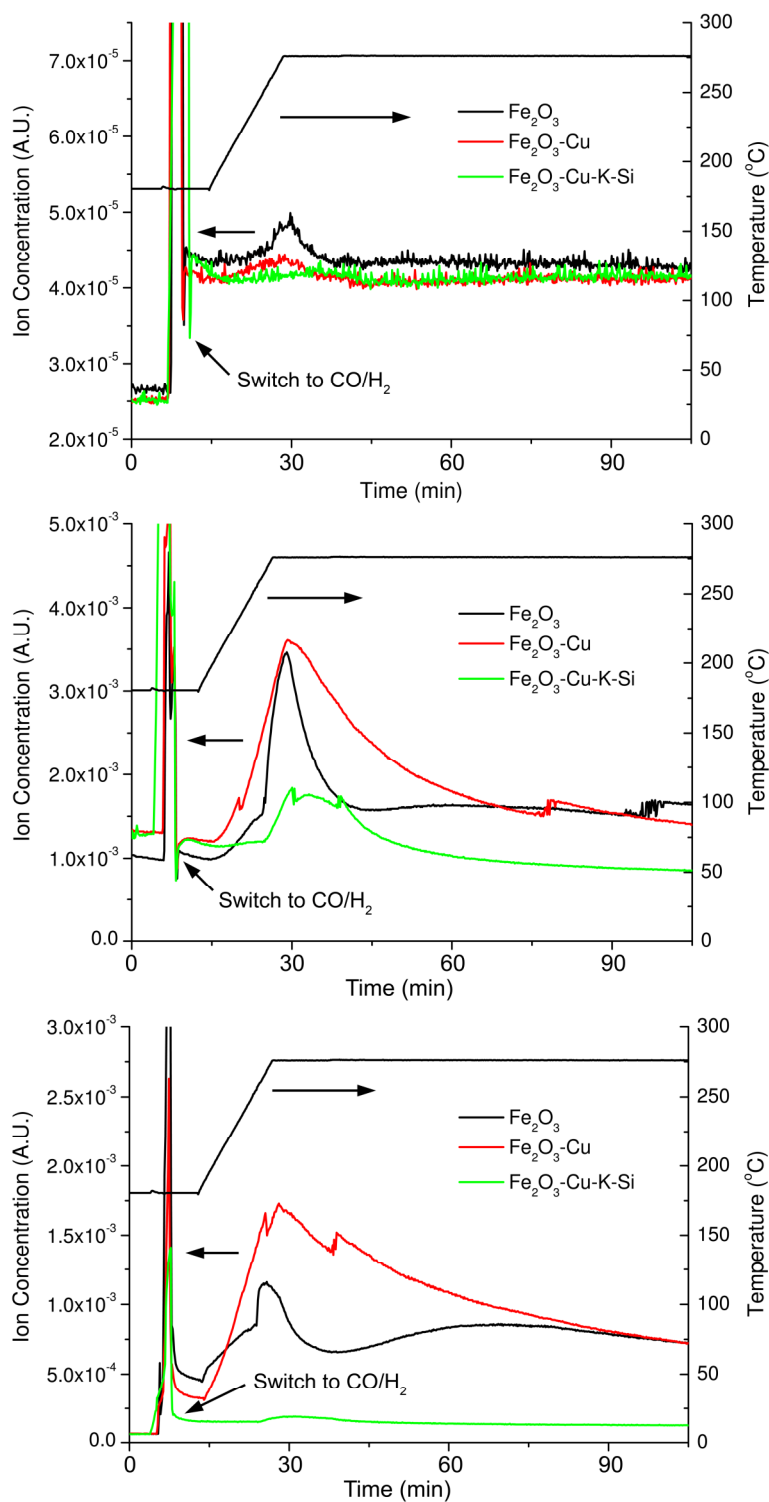
**Fig. E2** Representative TEM images of the Fe<sub>2</sub>O<sub>3</sub> (top), Fe<sub>2</sub>O<sub>3</sub>-Cu (middle) and Fe<sub>2</sub>O<sub>3</sub>-Cu-K-Si (bottom) materials after treatment in 0.4 mbar CO/H<sub>2</sub>.



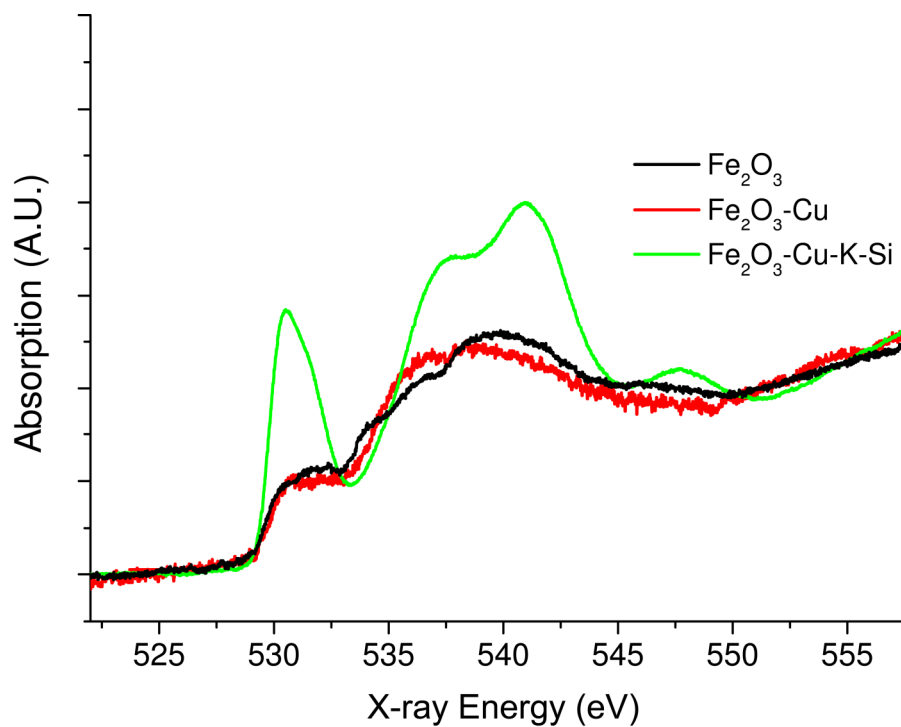
**Fig. E3** O K-edge XAS spectra of the catalysts before reduction treatment.



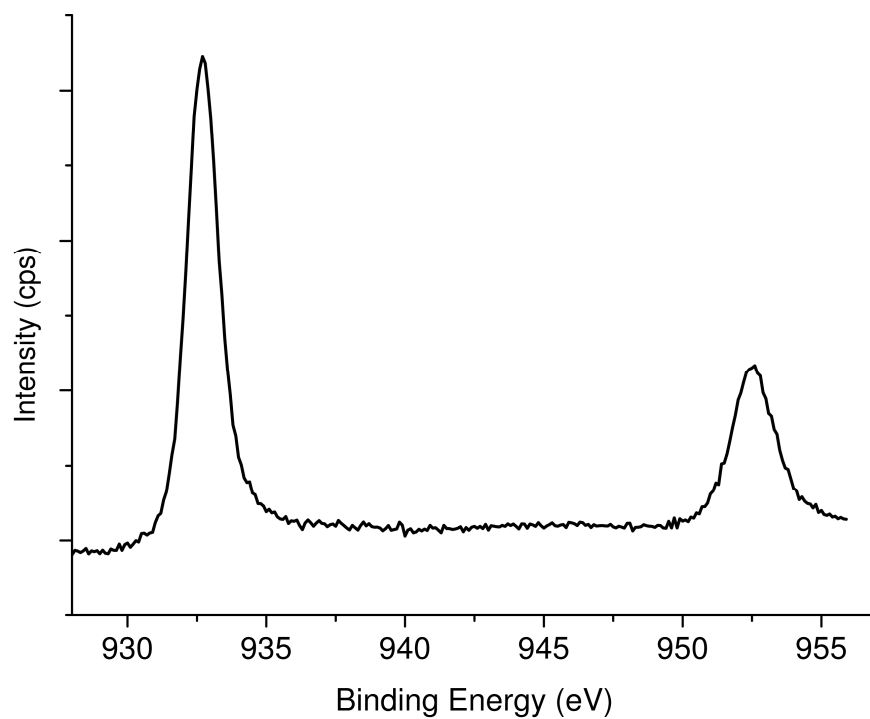
**Fig. E4** Fe L-edge XAS spectra of the unsupported catalysts after 1 h at 275°C in 0.4 mbar CO/H<sub>2</sub>.



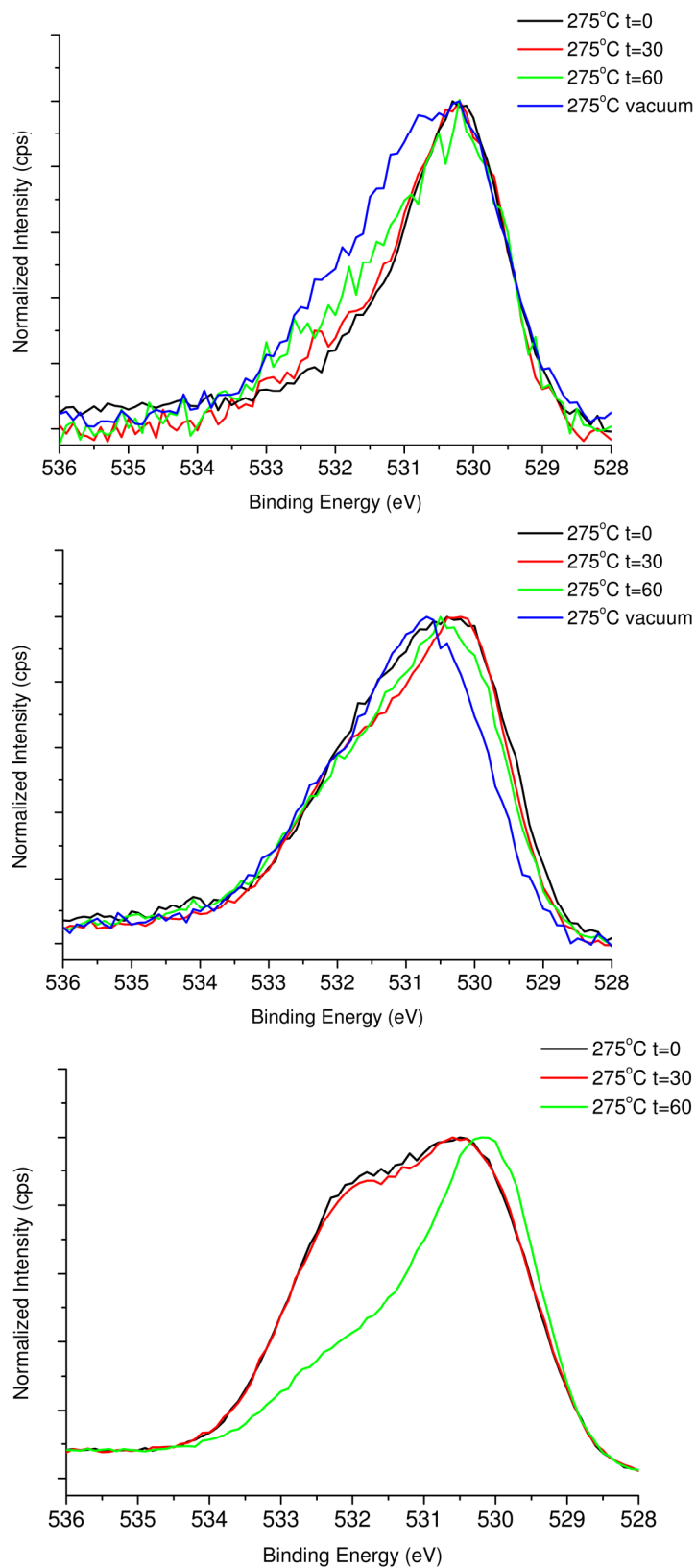
**Fig. E5** Mass spectrometry data of the product gases during the *in situ* XAS/XPS experiment during CO/H<sub>2</sub> treatment from 180°C to 275°C. Top: m/z = 15 (CH<sub>4</sub>), middle m/z = 18 (H<sub>2</sub>O) and bottom m/z = 44 (CO<sub>2</sub>).



**Fig. E6** O K-edge XAS spectra of the catalyst materials after reduction in 0.4 mbar CO/H<sub>2</sub>.



**Fig. E7** Cu 2p<sub>3/2</sub> and 2p<sub>1/2</sub> XPS spectrum of the Fe<sub>2</sub>O<sub>3</sub>-Cu catalyst after reduction in 0.4 mbar CO/H<sub>2</sub> at 275°C



**Fig. E8** O 1s XPS spectra of the catalysts during treatment in 0.4 mbar CO/H<sub>2</sub>. Top: Fe<sub>2</sub>O<sub>3</sub>, middle: Fe<sub>2</sub>O<sub>3</sub>-Cu and bottom: Fe<sub>2</sub>O<sub>3</sub>-Cu-K-Si.