Investigating the Surface Termination Effect of $CoFe_2O_4$ on the Selectivity in the Catalytic 2-Propanol Oxidation via ME-DRIFTS and RAMAN Spectroscopy

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Phase-pure isotropic and anisotropic $CoFe_2O_4$ nanoparticles were synthesised with the desired morphology.[1] A {111} termination for the anisotropic platelets is assumed.[1] Both catalysts were tested in the gas-phase 2-propanol oxidation. While the anisotropic catalyst displayed low propene selectivity of less than 5% and high acetone selectivity, the isotropic catalyst had 28% selectivity towards propene in the dry feed (see Figure 1a). The selectivity was not impacted by the presence of water in the gas-feed. To further analyse the differences between both catalysts in the dry and wet feed, activation energies and reaction orders were determined, which also revealed that the {111} surface was more impacted by gas-phase water. Furthermore, ME-DRIFTS (Figure 1b and 1c) and RAMAN measurements have been conducted to probe the (surface) properties of both catalysts. The selectivity changes can be attributed to different acid-base properties of the exposed surfaces, since more acidic sites favour propene formation. The ME-DRIFTS results also show different OH and acetate surface species on both catalysts.

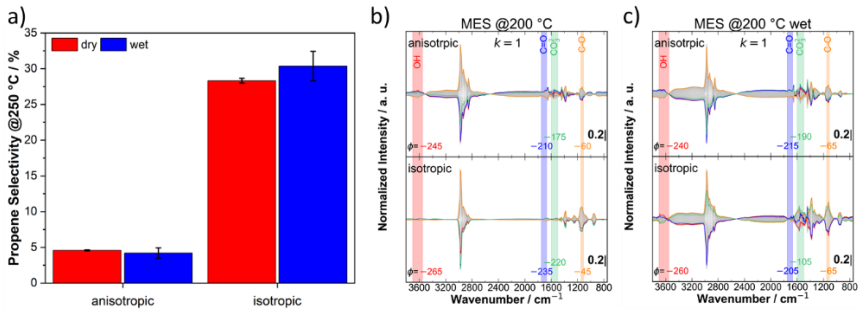

Figure 1: Propene selectivity (a) and ME-DRIFTS spectra of $CoFe_2O_4$ catalysts under dry (b) and wet (b) feed conditions.

[1] A. Rabe *et al*, *Chem. Eur. J.*, **2021,** 27, 17038-17048, 10.1002/chem.202102400
[2] S. Anke *et al*, *ACS Catal.,* **2019**, 9, 7, 5974–5985, 10.1021/acscatal.9b01048