Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supplementary materials

An investigation of Cu-Re-ZnO catalysts for the hydrogenolysis of glycerol under flow conditions

Mzamo L. Shozi[a], Venkata D.B.C. Dasireddy[a], Sooboo Singh[a], Pheladi Mohlala[b], David J. Morgan[c], Sarwat Iqbal[c] and Holger B. Friedrich[a*]

[a]School of Chemistry and Physics, University of KwaZulu-Natal, Durban, 4000, South Africa

[b]Sasol Technology R&D, 1 Klasie Havenga Street, Sasolburg, 1974, South Africa

[c]Cardiff Catalysis Institute, Cardiff University, Main Building, Park Place, Cardiff, CF10 3AT, United Kingdom

[*] To whom correspondence should be addressed: Email: friedric@ukzn.ac.za

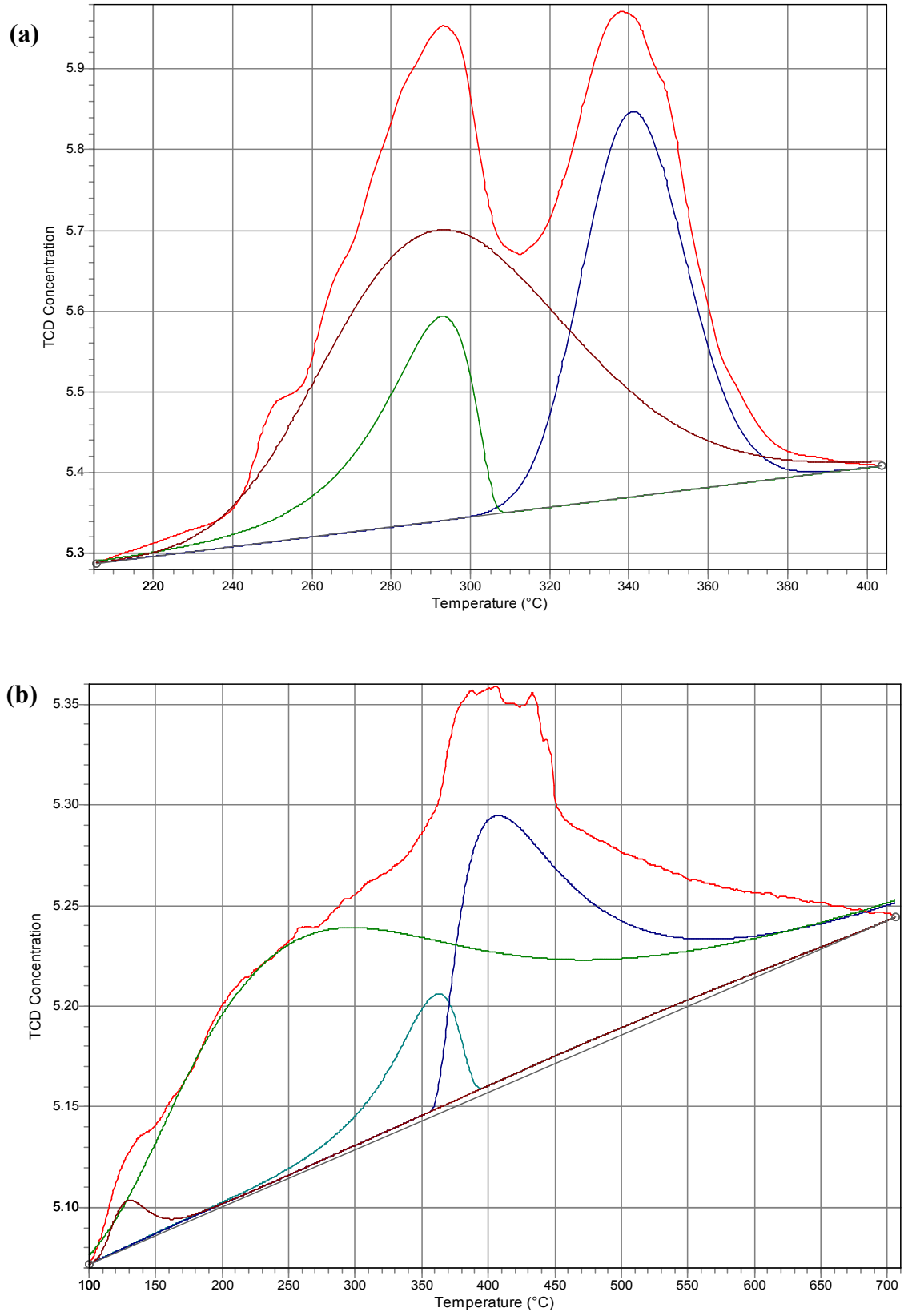

Figure S1. Deconvolution of the TPR profiles of (a) Cu/ZnO and (b) Re/ZnO in order to determine reduction temperatures.

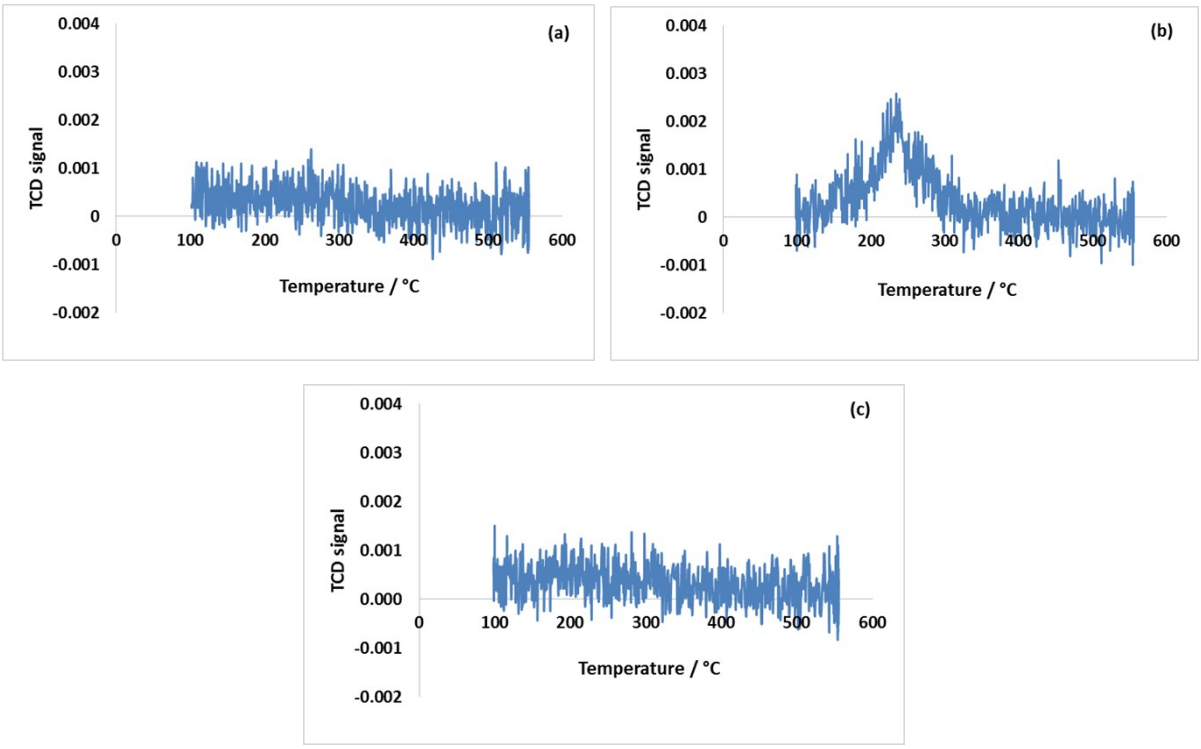

Figure S2. TPD profiles of (a) Cu/ZnO, (b) Re/ZnO and Re-Cu/ZnO. The mass spectrometer is calibrated in order to obtain quantitative data. This is achieved by injecting a known volume of the gas to be detected (propylene), V_{cal} through the septum. The peak area, A_{cal} of the mass spectrometer signal for propylene can be obtained from the AutoChem peak-editing software. The ratio of (V_{cal}/ A_{cal}) can be used as a calibration factor for the calculations of Brønsted acid sites concentrations, N_{as}, using the formula below:

$$N_{as} = A_{pms}\left(\frac{V_{cal}}{A_{cal}}\right)\left(\frac{L}{10^3 cc}\right)\left(\frac{mole}{22.414\,L@STP}\right)\left(\frac{10^6\,\mu moles}{mole}\right)$$

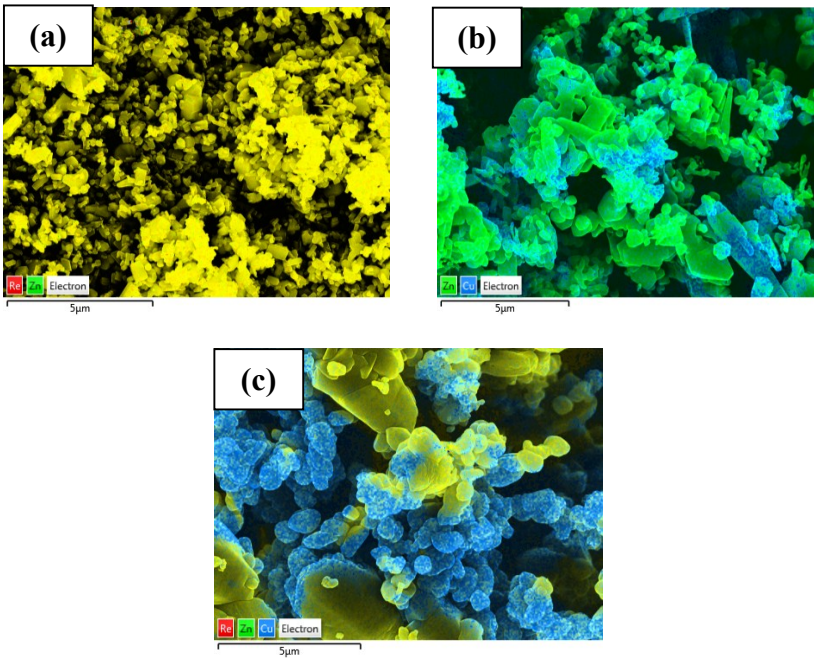

Figure S3. SEM-EDX images of (a) ReO_x/ZnO, (b) CuO/ZnO and (c) Re-CuO/ZnO

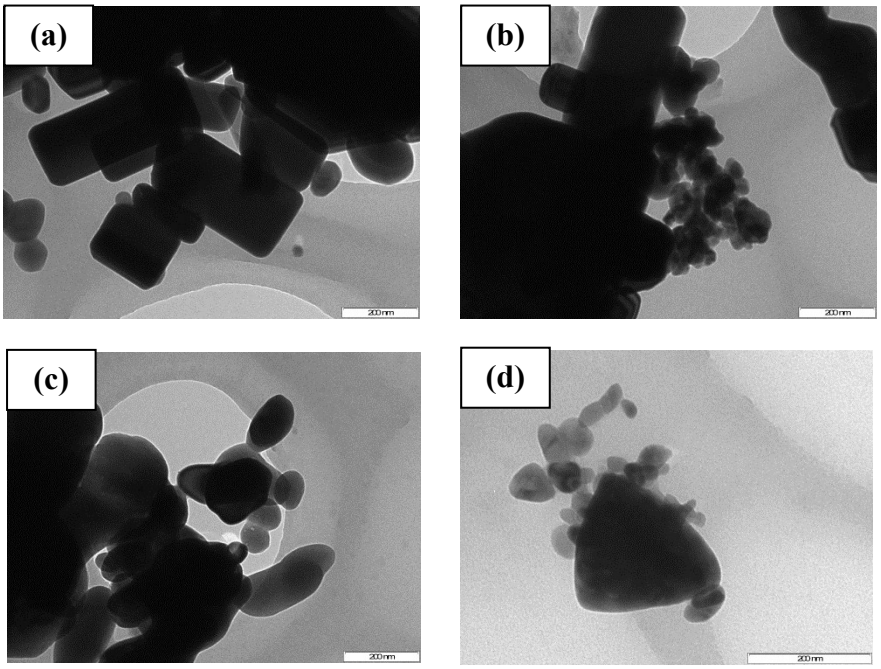

Figure S4. TEM images of (a) ZnO, (b) ReO_x/ZnO, (c) CuO/ZnO and (d) Re-CuO/ZnO

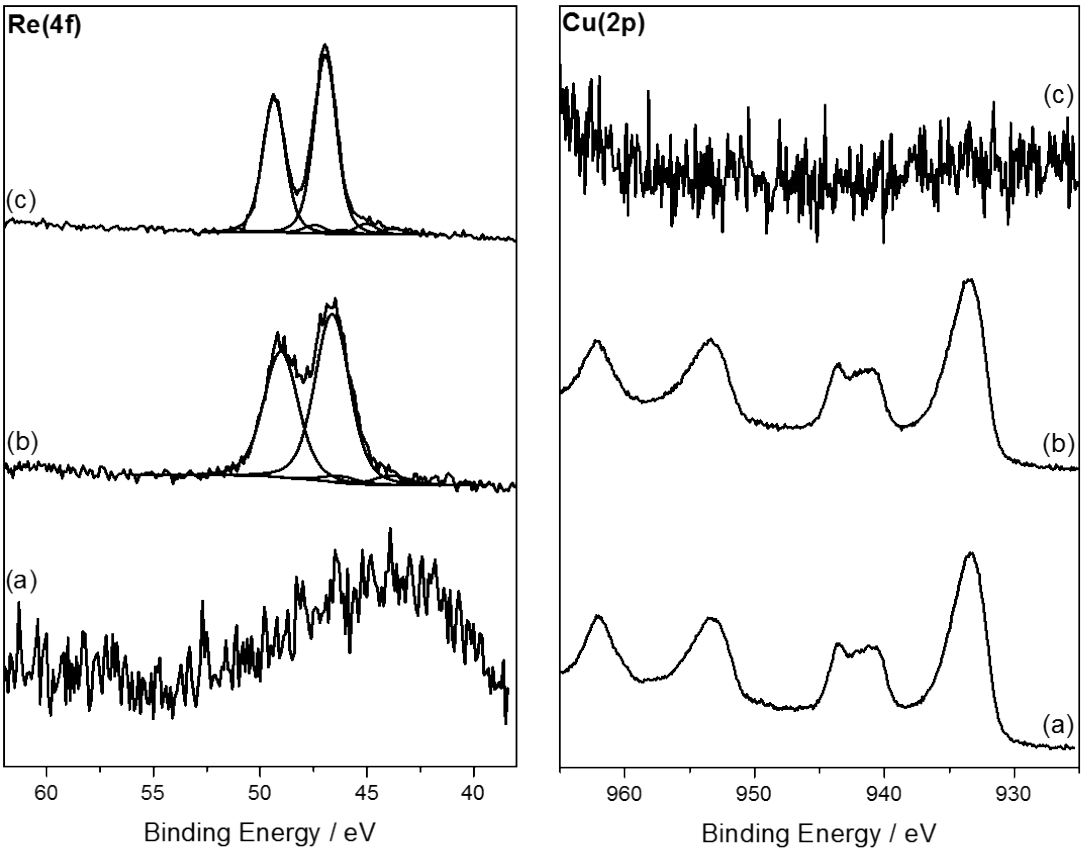

Figure S5. The Re(4f) and Cu(2p) core-level spectra for the catalysts: (a) CuO/ZnO, (b) Re-CuO/ZnO and (c) ReO_x/ZnO. Cu is Cu(2+) oxide, whilst Re is predominantly Re(7+) (Re_2O_7). The small lower peaks come from reduction under x-ray beam.

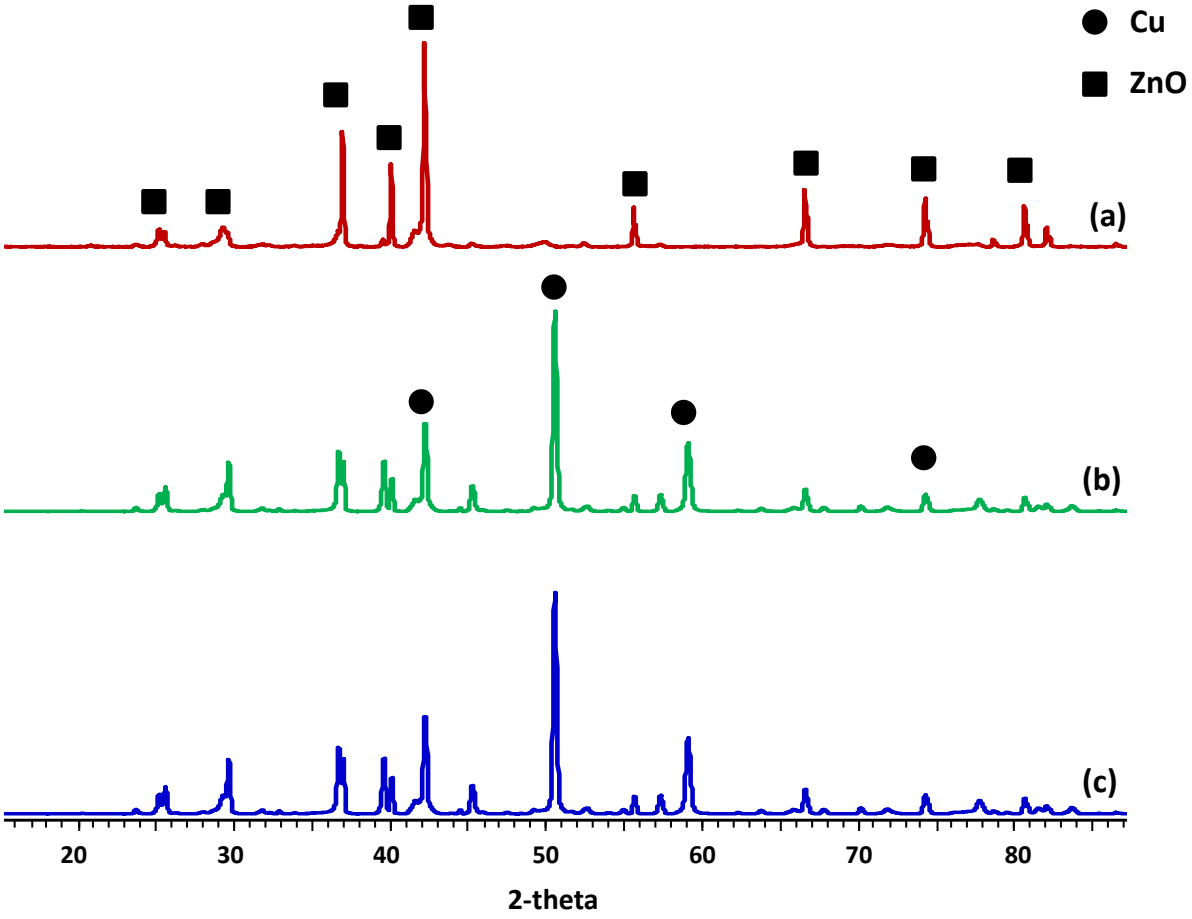

Figure S6. XRD diffractograms of spent catalysts (a) Re/ZnO, (b) Cu/ZnO and (c) Re-Cu/ZnO.