Supplementary Information

Co_3O_4 morphology in the preferential oxidation of CO

Motlokoa Khasu, Thulani Nyathi, David J. Morgan, Graham J. Hutchings, Michael Claeys, Nico Fischer*

*Catalysis Institute and c*change (DST-NRF Centre of Excellence in Catalysis), Department of Chemical Engineering, University of Cape Town, Rondebosch 7701, Cape Town, South Africa, *nico.fischer@uct.ac.za*

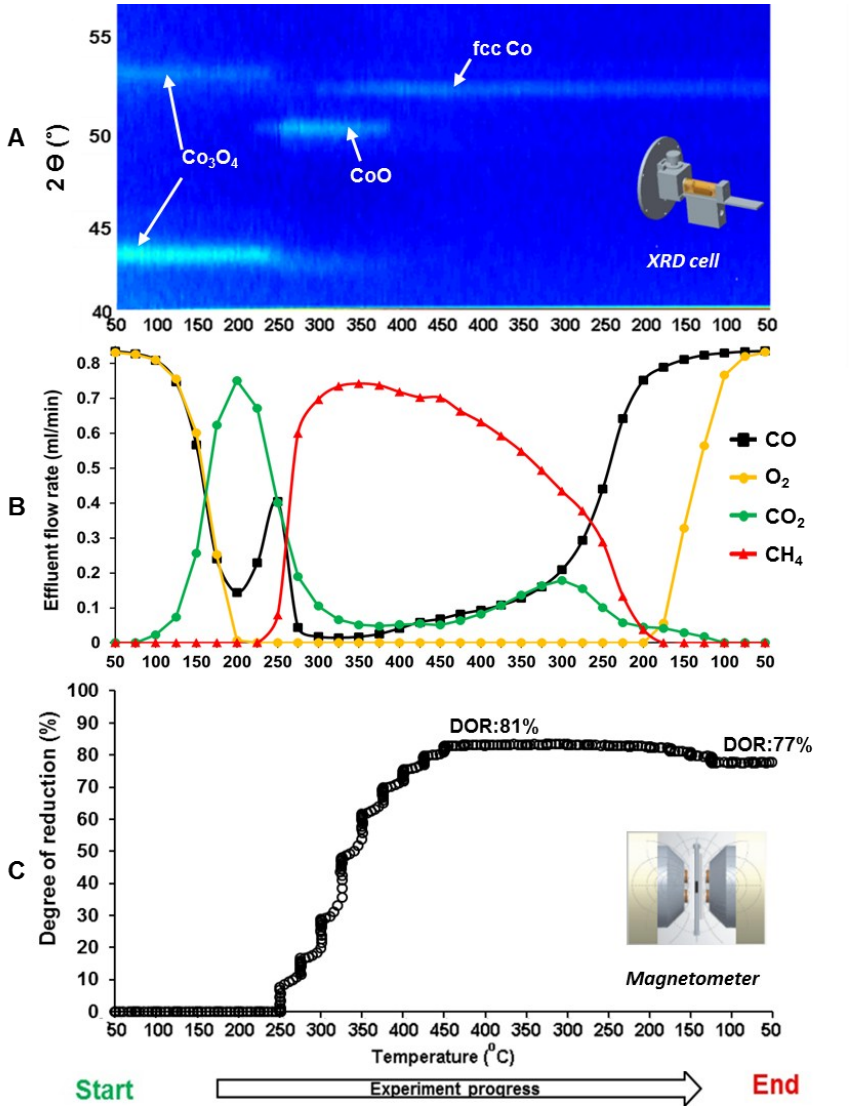


Figure S1: In situ XRD scans and degree of reduction from magnetometer measurements for nanosheets/SiO_2. A: in situ XRD on top view. B: effluent flow rate of CO, CO_2, CH_4 and O_2. C: degree of reduction measured in the magnetometer. (Temperature: 450 °C, Heating rate: 50 °C to 450 °C back to 50 °C holding for 1 hr every 25 °C with a ramp rate of 1 °C/min, magnetic readings: taken at -20, 0, 20 and 0 kOe every 10 min).

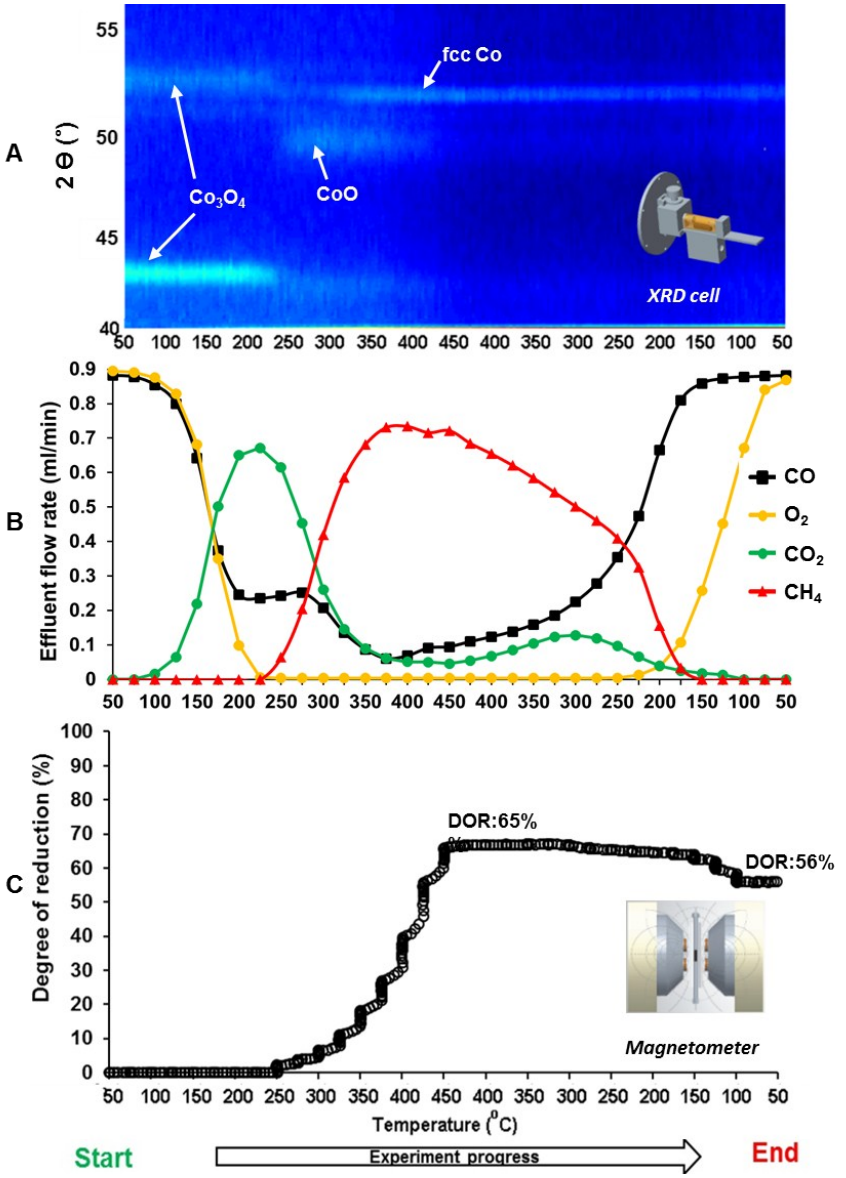
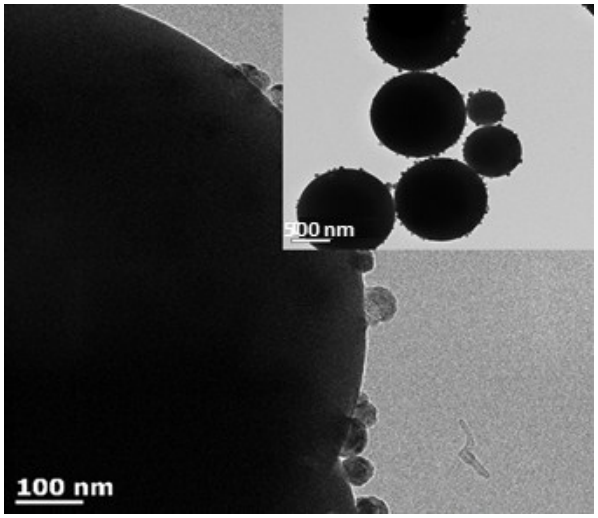
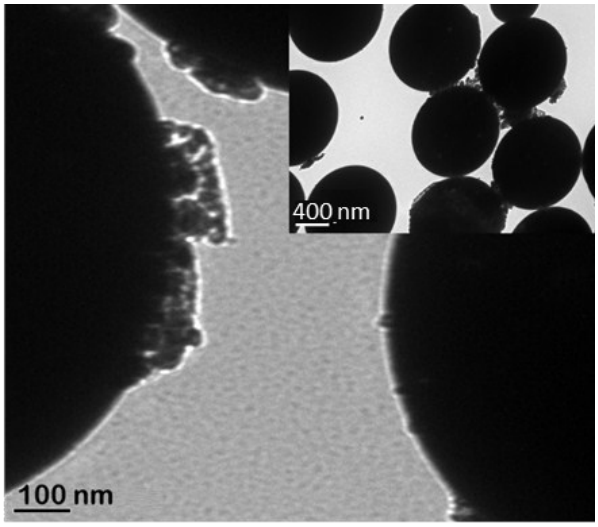


Figure S2: In situ XRD scans and degree of reduction from magnetometer measurements for nanobelts/SiO_2. A: in situ XRD on top view. B: effluent flow rate of CO, CO_2, CH_4 and O_2. C: degree of reduction measured in the magnetometer. (Temperature: 450 °C, Heating rate: 50 °C to 450 °C back to 50 °C holding for 1 hr every 25 °C with a ramp rate of 1 °C/min, magnetic readings: taken at -20, 0, 20 and 0 kOe every 10 min).

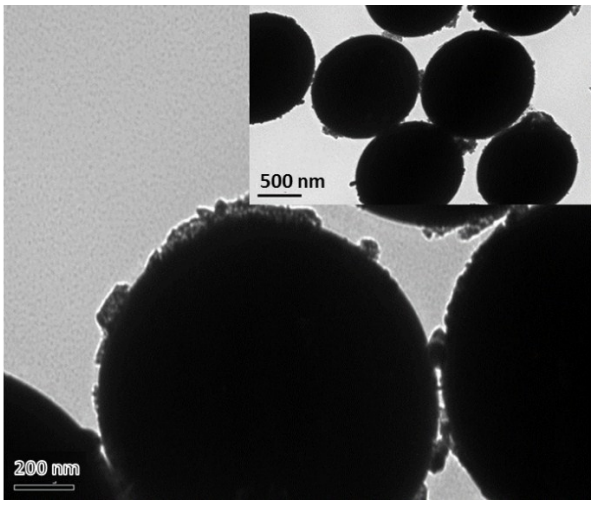
Nanocubes/SiO_2



Nanosheets/SiO_2



Nanobelts/SiO_2



Nanoparticles/SiO_2

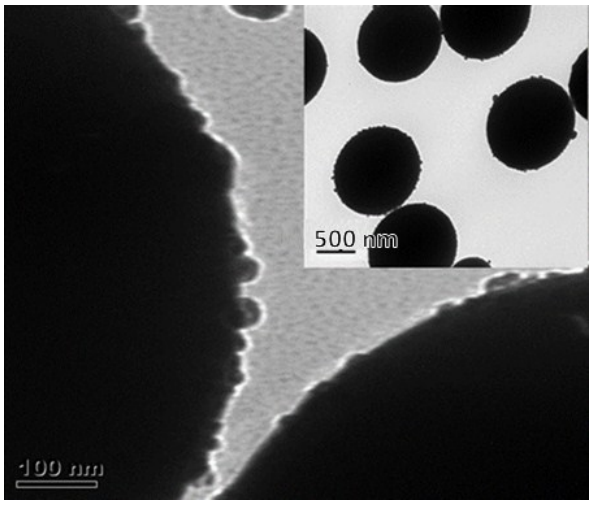
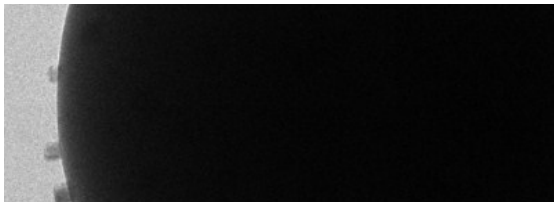
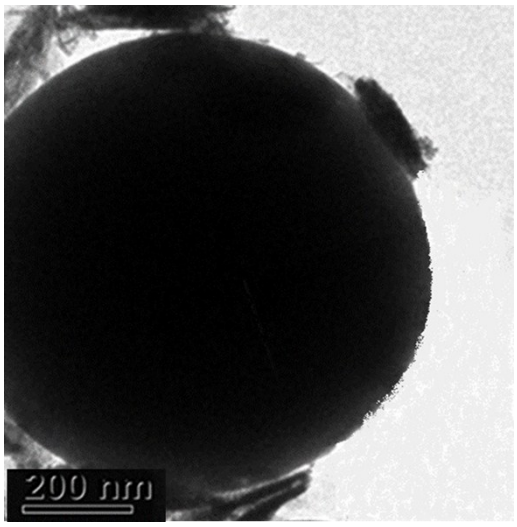


Figure S3: TEM micrographs of spent Co_3O_4/SiO_2 model catalysts after exposure to CO-PROX reaction conditions at maximum temperature of 450 °C.

Nanocubes/SiO_2

Nanosheets/SiO_2





Nanobelts/SiO_2

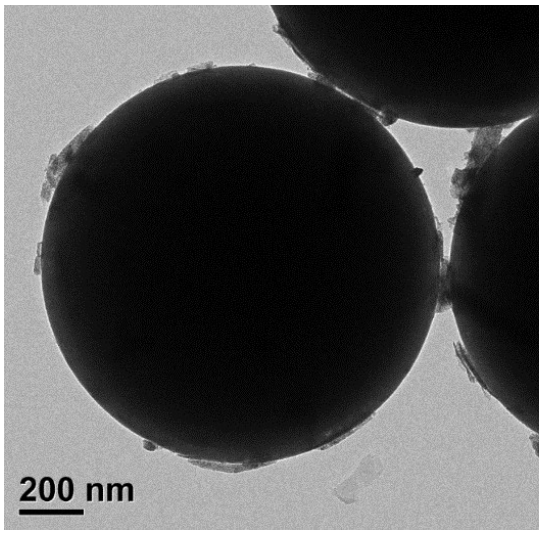


Figure S4: TEM micrographs of Co_3O_4/SiO_2 model catalysts after exposure to CO-PROX reaction conditions up to a temperature of 270°C for the nanocubes and 250°C for the nanosheets and nanobelts. XRD confirms the reduction to CoO.

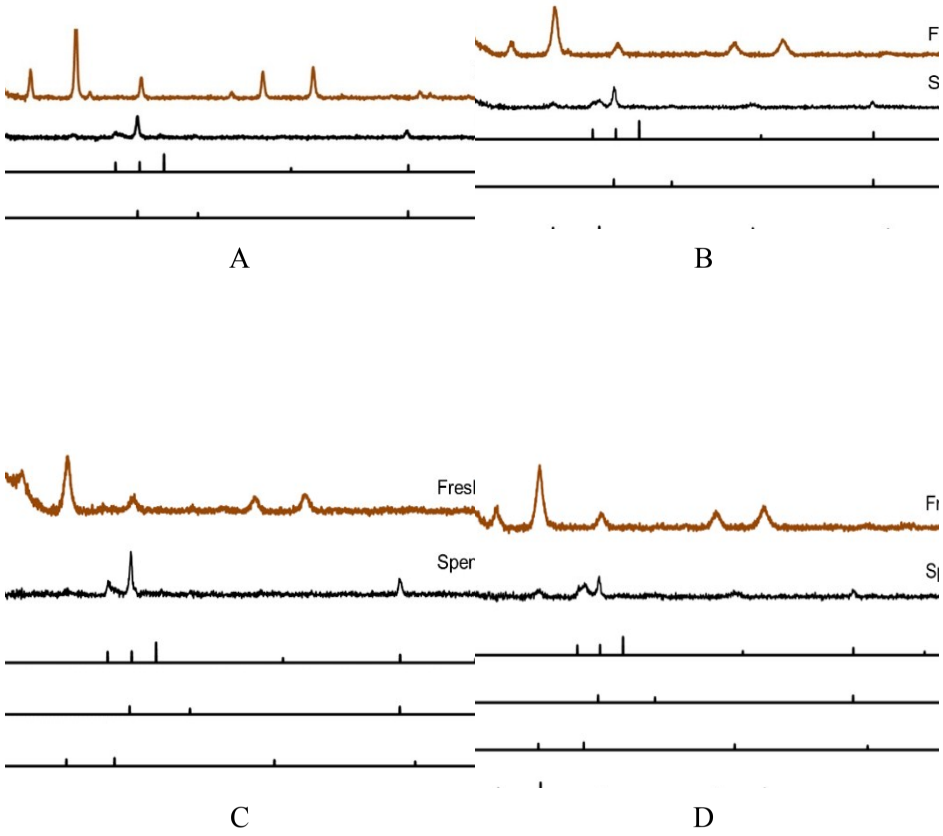


Figure S5: XRD scans of fresh and spent Co_3O_4/SiO_2 model catalyst(A) nanocubes, (B) nanosheets, (C) nanobelts, (D) N-

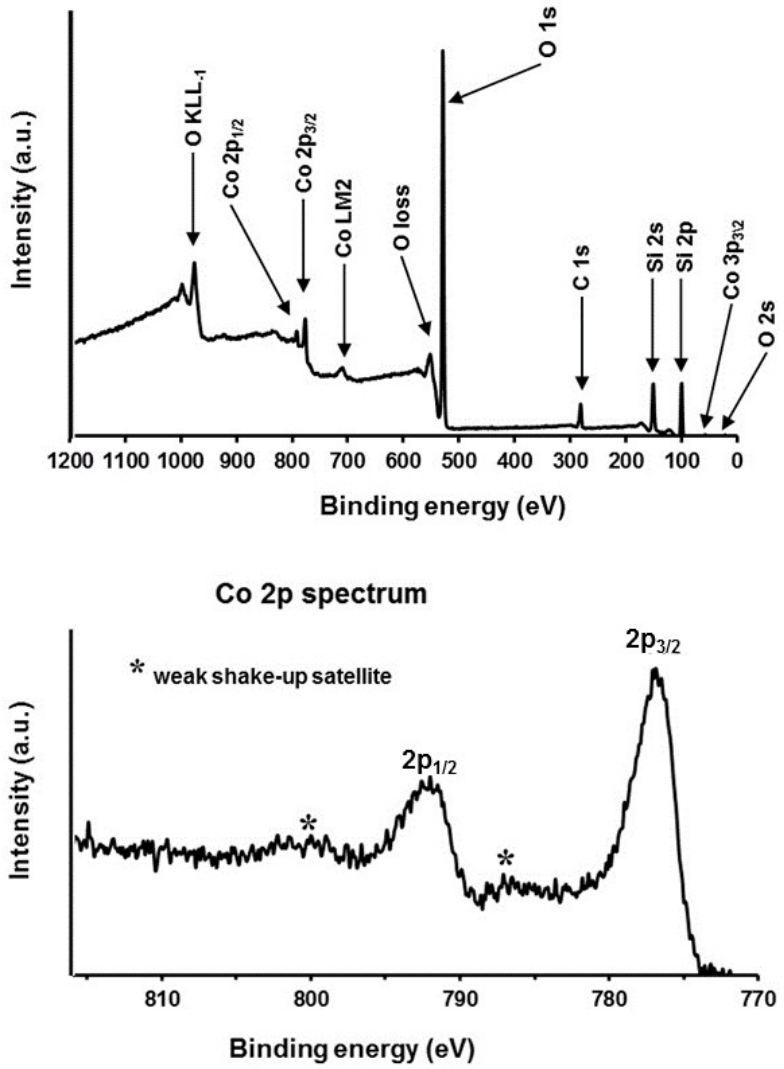


Figure S6: XPS profiles of wide spectrum, Co 2p in the Co_3O_4/SiO_2 (nanocubes)

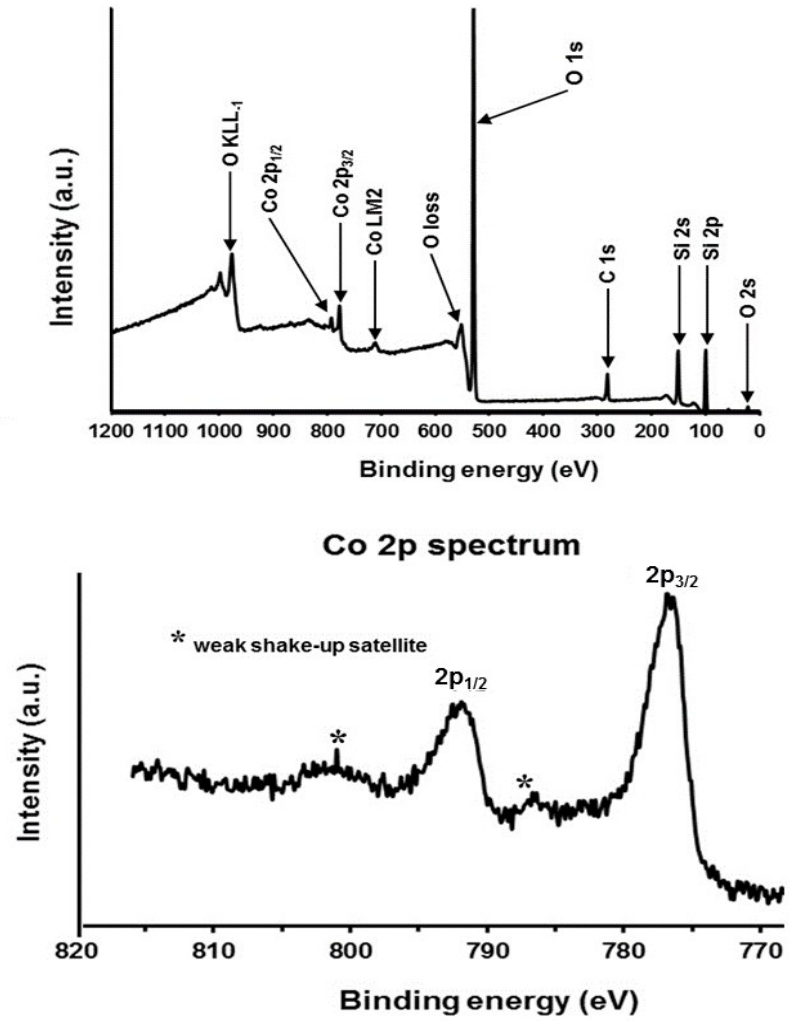


Figure S7: XPS profiles of wide spectrum, Co 2p in the Co_3O_4/SiO_2 (nanosheets)

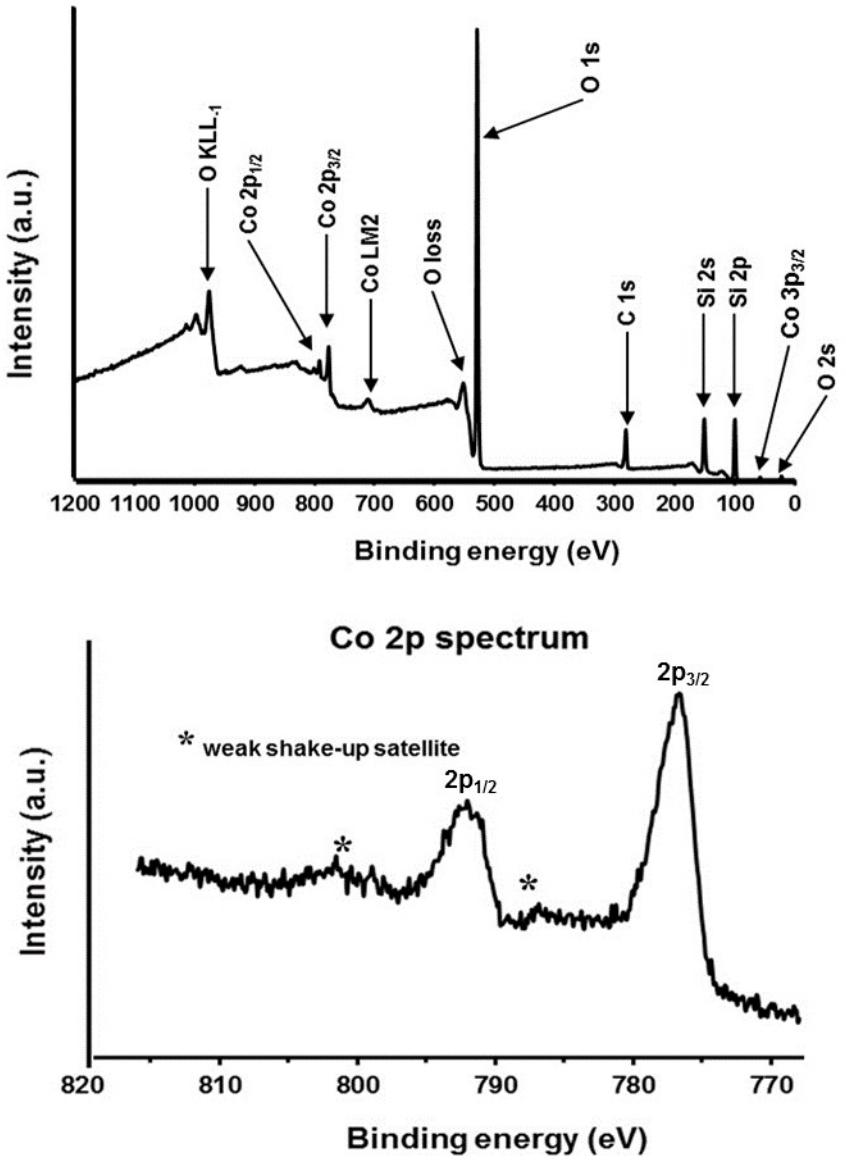


Figure S8: XPS profiles of wide spectrum, Co 2p in the Co_3O_4/SiO_2 (nanobelts)

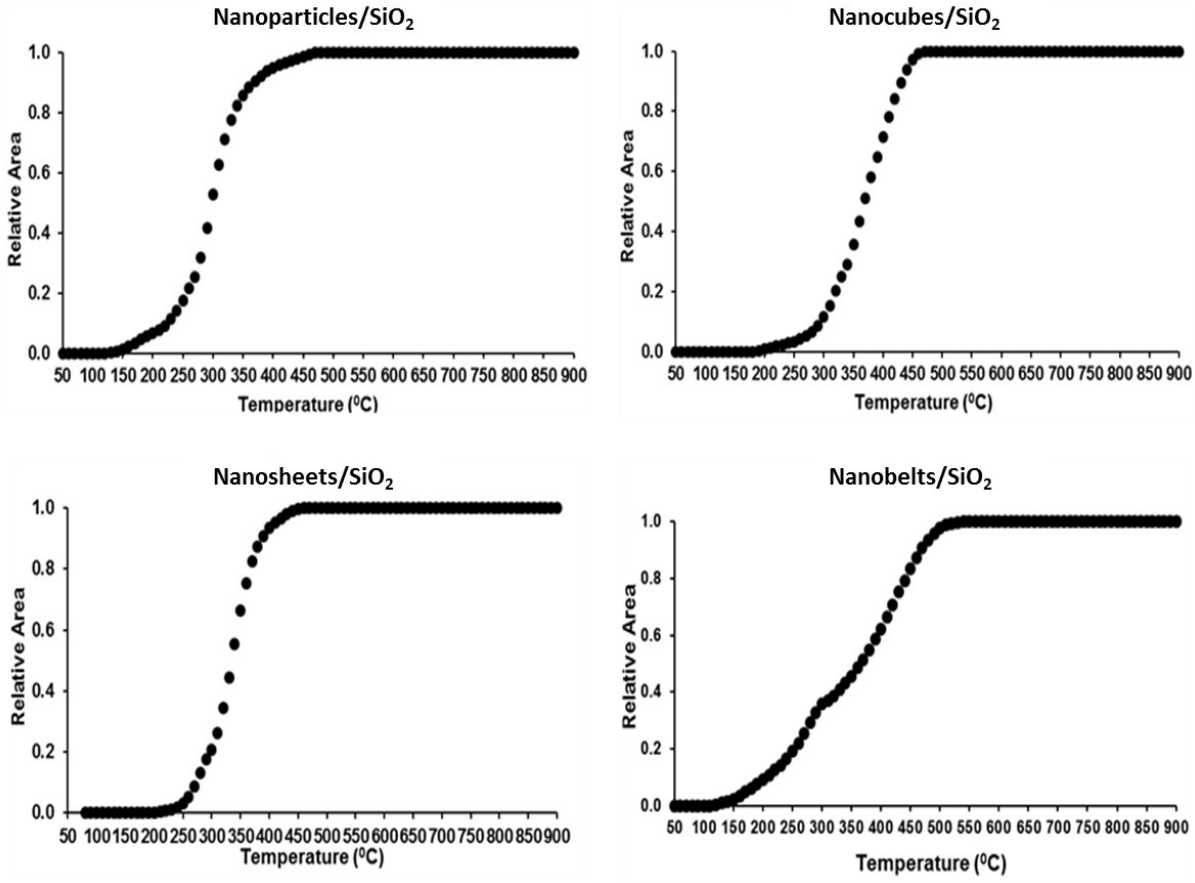


Figure S9: Cumulative area under the H_2-TPR for the supported nanoparticles, nanocubes, nanosheets and nanobelts model catalysts