

Supplementary Data

for Catalysts

Influence of co-precipitation agent on the structure, texture and catalytic activity of Au-CeO₂ catalysts in low-temperature oxidation of benzyl alcohol

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Extended experimental section – Characterization of materials.

Fig. S1. HRTEM image (a) and SAED diffraction pattern (b) of sample CeO₂_N. In the inset the interplanar distance between 111 planes is denoted.

Fig. S2. HRTEM image (a) and SAED diffraction pattern (b) of sample CeO₂_H. In the inset the interplanar distance between 111 planes is denoted.

Fig. S3. HRTEM image (a) and SAED diffraction pattern (b) of sample CeO₂_U. In the inset the interplanar distance between 111 planes is denoted.

Extended experimental section – Characterization of materials:

The content of metals in the catalysts was determined by Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES 9820 Shimadzu, Japan). Before the quantifications, the samples (approximately 100 mg) were weighted and placed in a clean Teflon vessel with 65% HNO₃ and 48% HF (Merck, Germany). Digestion was carried out using a Microwave Reaction System: Multiwave PRO equipped with the acid digestion rotor 8NXF100.

The XRD patterns were recorded on a D8 Advance diffractometer (Bruker) using CuK α radiation ($\lambda=0.154$ nm), with a step size of 0.02° in the 2 Θ =21–81° range.

The N₂ adsorption-desorption isotherms were recorded at –196°C using a Micromeritics ASAP 2020 Physisorption Analyzer. Before measurements, the samples were degassed at 120°C for 10 h. The surface area of the materials was estimated by the BET method, while the average pore size was estimated from adsorption branch using the BJH method.

The morphology of the synthesized catalyst was investigated by using a scanning electron microscope Quanta FEG 250 (FEI) operated at the accelerating voltage of 5 kV.

High resolution transmission electron microscopy (HRTEM), selected area electron diffraction (SAED), scanning transmission electron microscopy (STEM) and energy dispersive spectroscopy (EDS) investigations were carried out by means of JEOL ARM 200F equipped with EDS detector.

Diffuse reflectance UV–vis spectra (DR UV–vis) were recorded on a Varian Cary 300 Scan spectrophotometer equipped with a diffuse reflectance accessory. The spectra were recorded at room temperature in the range from 200 to 800 nm. Spectralon was used as the reference material.

X-ray photoelectron spectroscopy (XPS) was performed using an ultra-high vacuum photoelectron spectrometer based on Phoibos150 NAP analyzer (Specs, Germany). The analysis chamber was operated under vacuum with a pressure close to 5×10^{-9} mbar and the sample was irradiated with a monochromatic Al K α (1486.6 eV) radiation. Any charging that occurred during the measurements (due to incomplete neutralization of ejected surface electrons) was accounted for by rigidly shifting the entire spectrum by a distance needed to set the binding energy of the C 1s assigned to adventitious carbon to the assumed value of 284.8 eV. Deconvolution of XPS spectra was performed using the CasaXPS software.

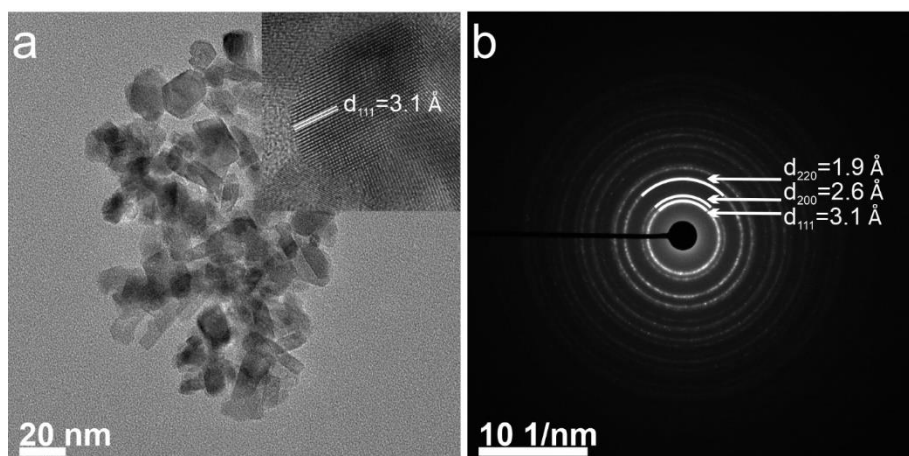


Fig. S1. HRTEM image (a) and SAED diffraction pattern (b) of sample CeO₂_N. In the inset the interplannar distance between 111 planes is denoted.

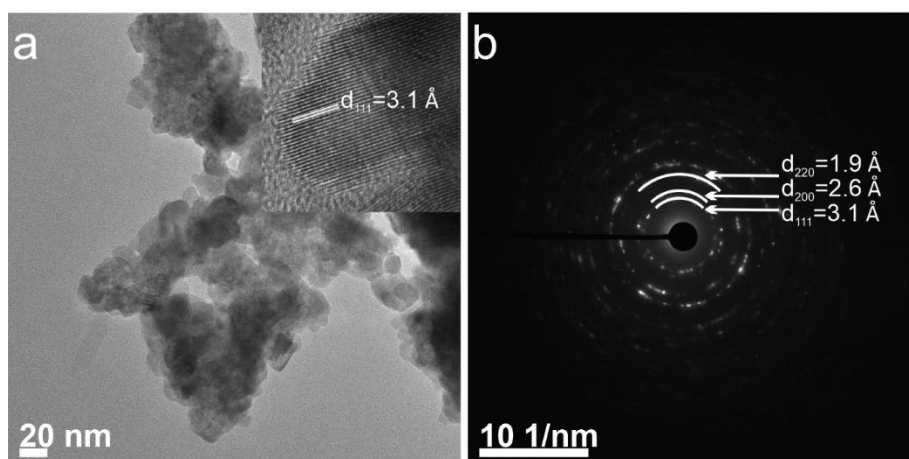


Fig. S2. HRTEM image (a) and SAED diffraction pattern (b) of sample CeO₂_H. In the inset the interplannar distance between 111 planes is denoted.

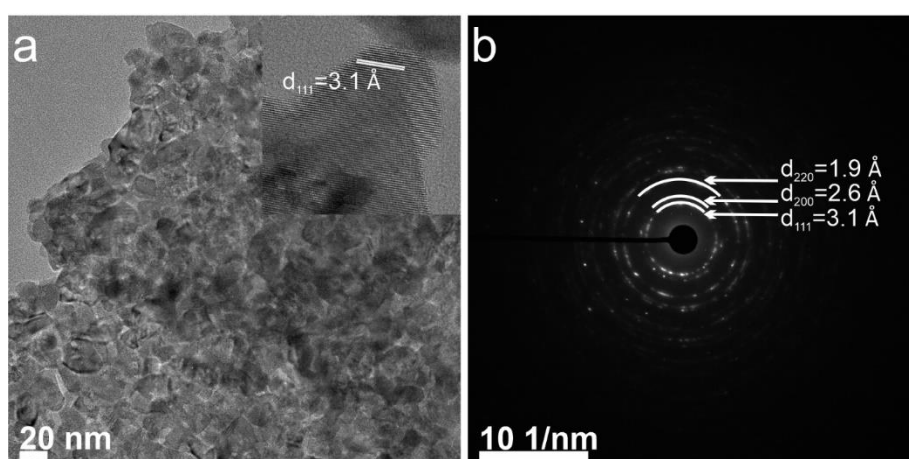


Fig. S3. HRTEM image (a) and SAED diffraction pattern (b) of sample CeO₂_U. In the inset the interplannar distance between 111 planes is denoted.