Electronic Supplementary Material (ESI) for Dalton Transactions

SUPPLEMENTARY INFORMATION

Engineering microstructure and redox properties in the mixed conductor $Ce_{0.9}Pr_{0.1}O_{2-\delta}$+Co 2 mol %

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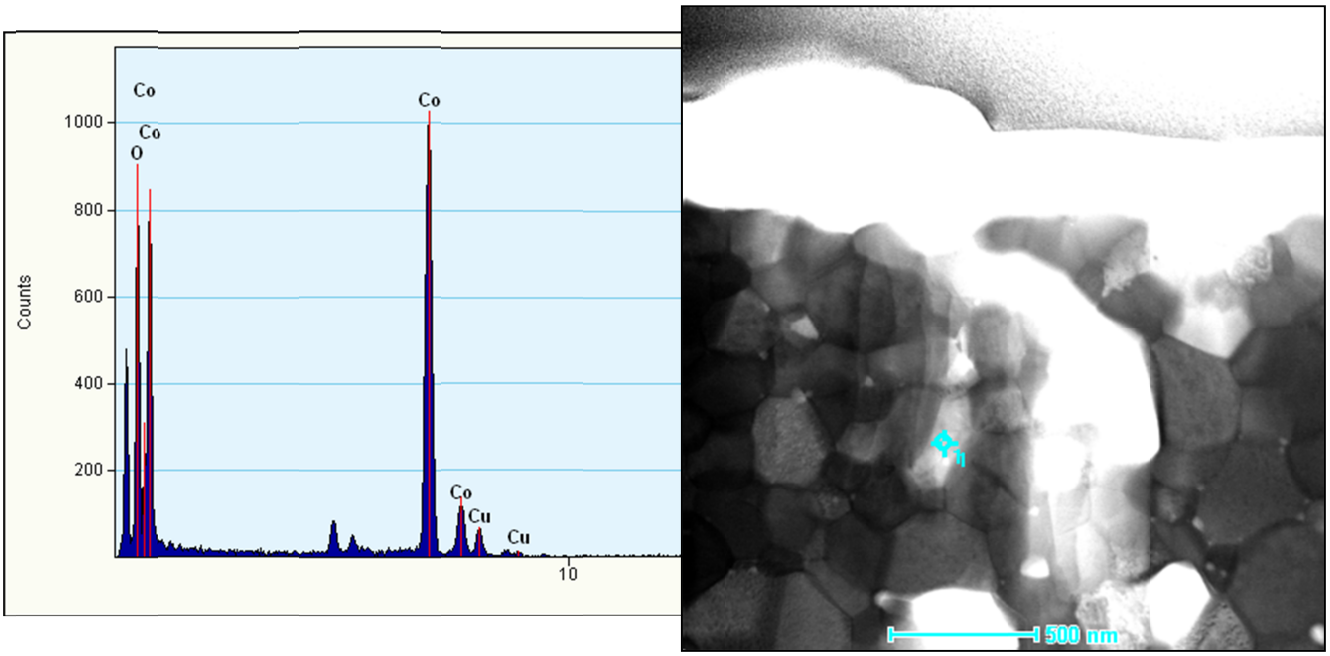

Figure S1: TEM-EDS on a 1000 ºC CPCo grain. Co appears dispersed along the grain surface, while fine CP-CP grain interface is shown.

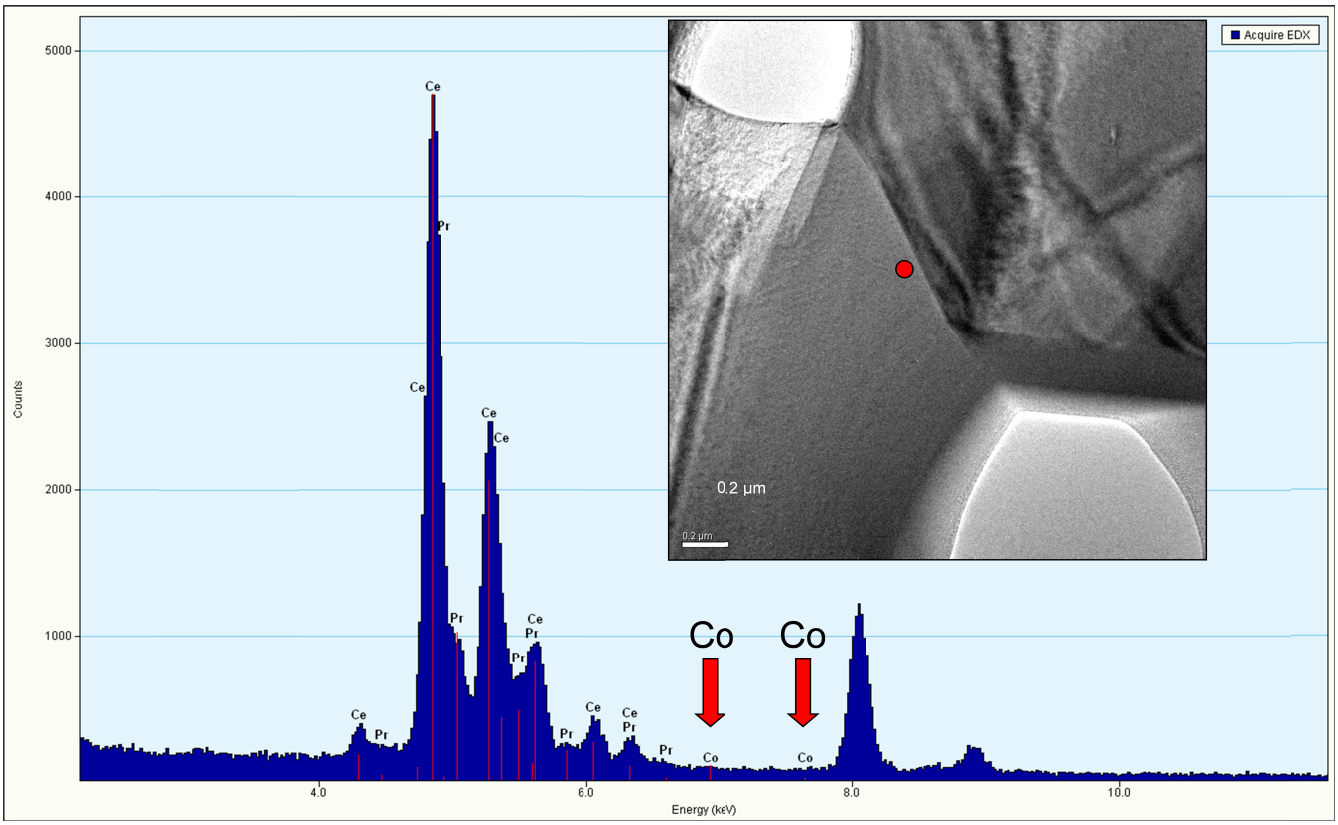

Figure S2: TEM-EDS on a 1450 ºC CPCo grain boundary. A fine CP-CP grain interface is shown. Co was not detected either in the grain boundaries or in fringes and surfaces.

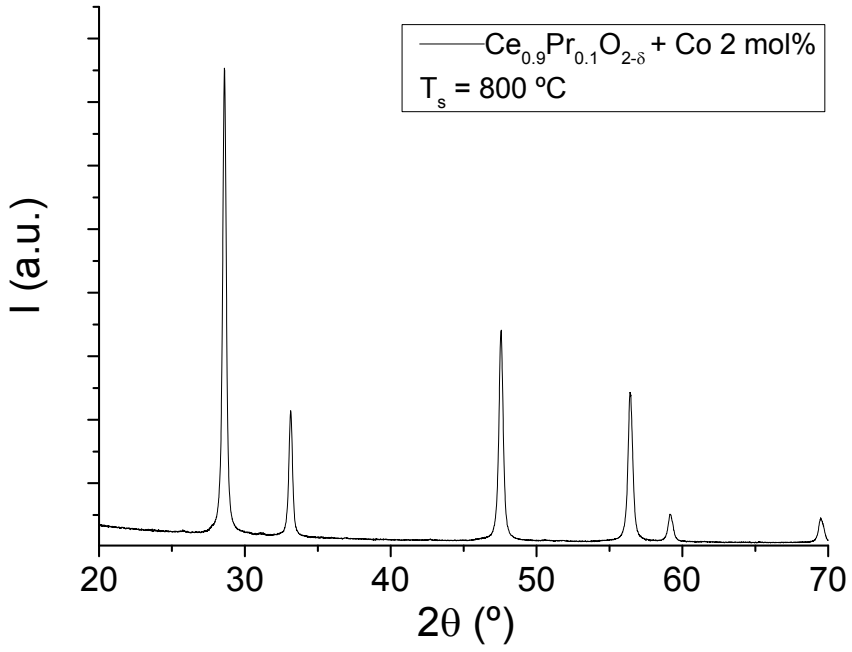

Figure S3: XRD of as-prepared CPCo (800 ºC).

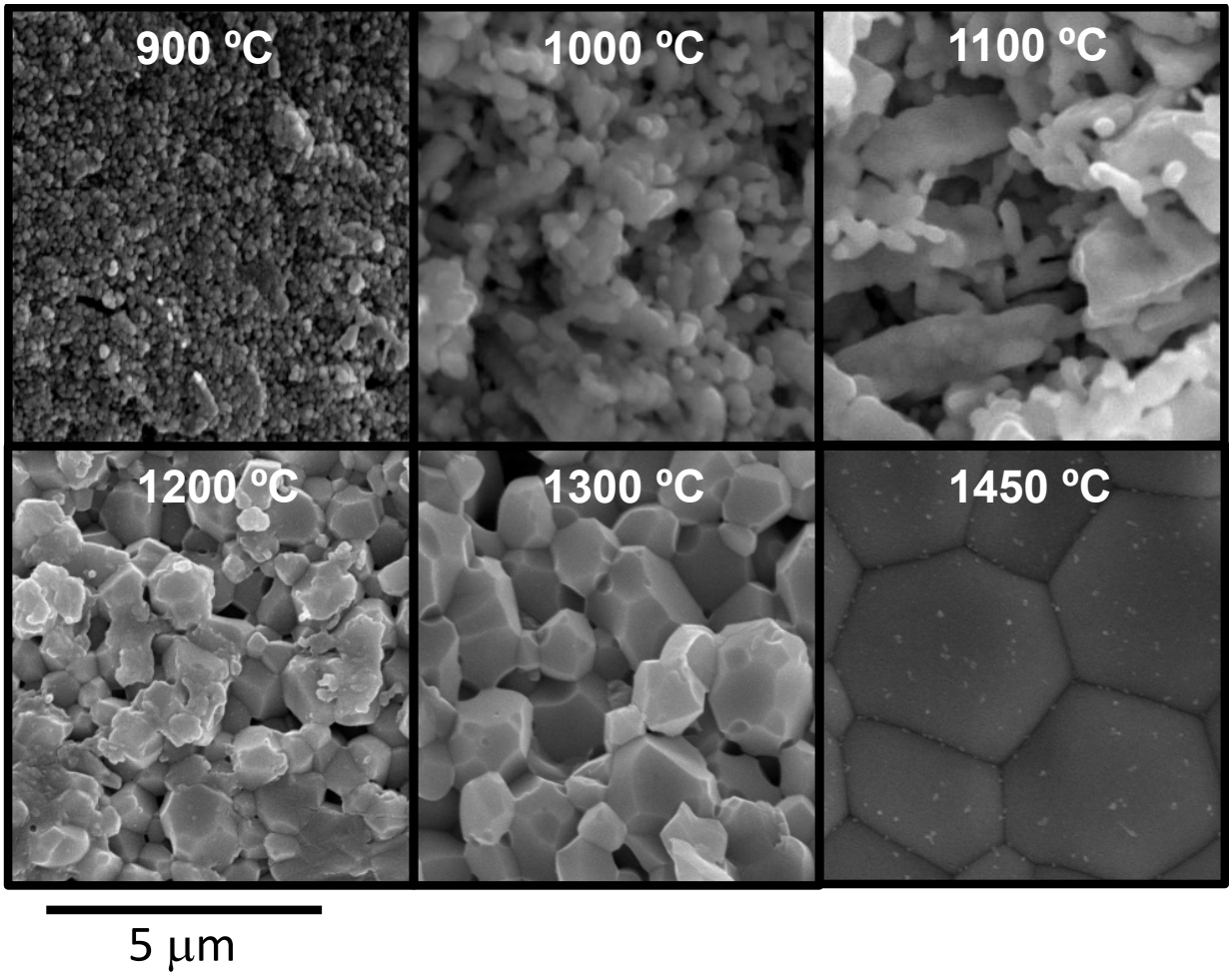

Figure S4: SEM images of the samples sintered at six different temperatures. Images recorded using a using a JEOL JSM6300 scanning electron microscopes (FE-SEM).

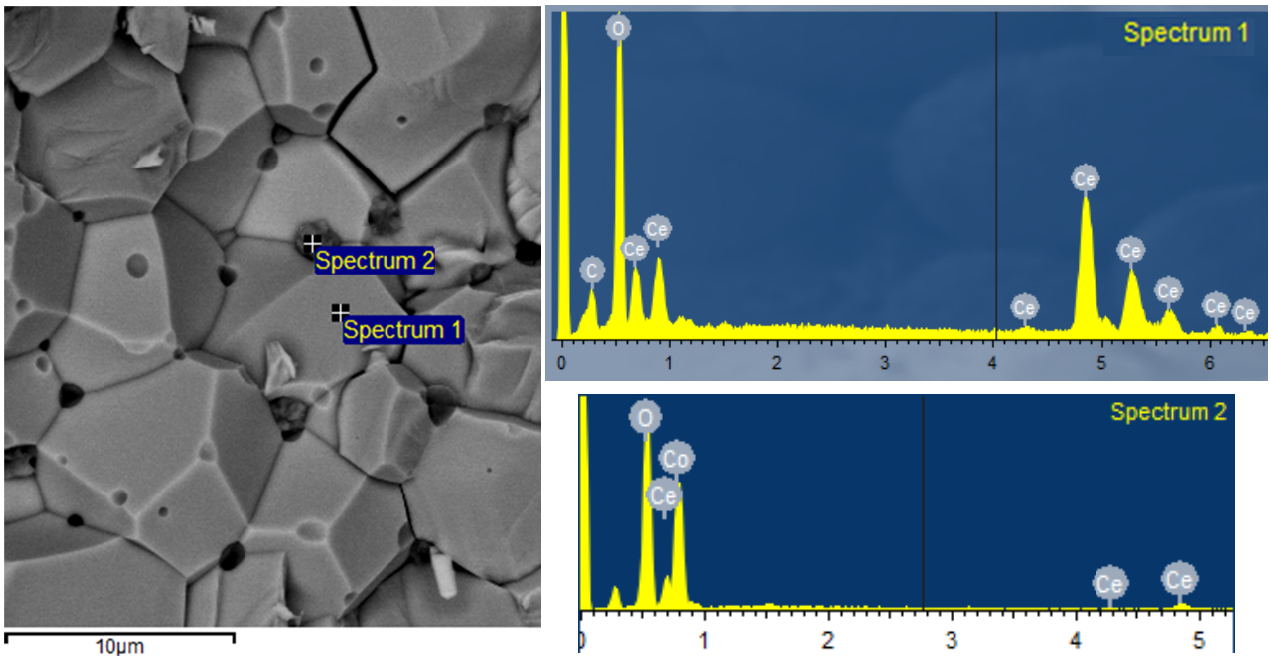

Figure S5: SEM image and EDS point-analysis of the sample sintered at 1450ºC. Images recorded using a ZEISS Ultra55 field emission scanning electron microscope.

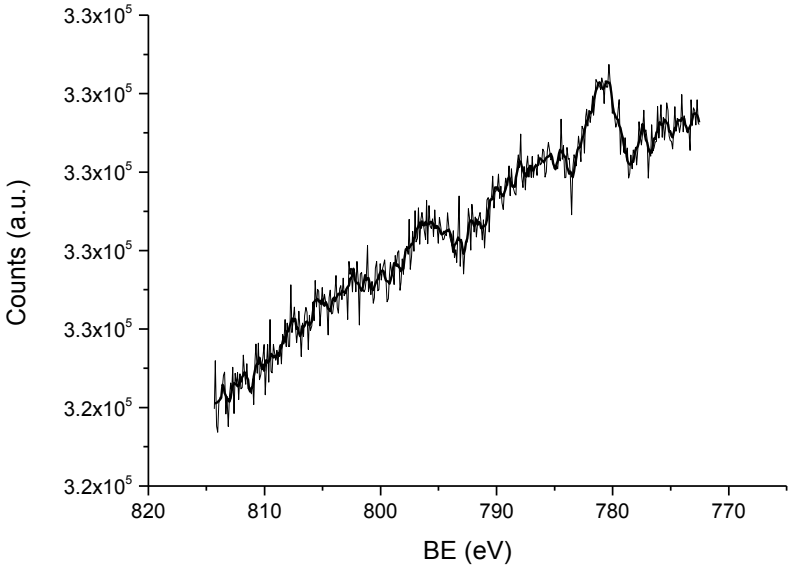

Figure S6: XPS measurement for the sample sintered at 1000 ºC. The presence of Co has been detected. XPS peak positions (Co 2p 3/2 at 781 eV) agree with the presence of Co_3O_4. However, as the amount of CoOx added is very low (ca. 2mol%) the spectrum is very noisy and no deconvolution to determine the oxidation state could be accurately done. According to Carson et al. (G.A. Carson, M.H. Nassir, M.A. Langel, J. Vac. Sci. Technol. A 14 (1996) 1637) and Yao et al. (Journal of Power Sources 205 (2012) 180– 187) the Co 2p XPS peak positions agree with the presence of Co_3O_4.

X-ray photoelectron spectroscopy (XPS) measurements were carried out on a SPECS spectrometer with a MCD-9 detector, using a non-monochromatic Al K (1486.6 eV) X-ray source. Spectra were recorded using an analyzer with pass energy of 30 V, and an X-ray power of 100 W, under an operating pressure of 10^{-9} mbar.