Supporting Information

Analysis of vacancy generation and oxygen uptake in Cu doped Pr-CeO_2 materials using neutron and *in-situ* X-ray diffraction

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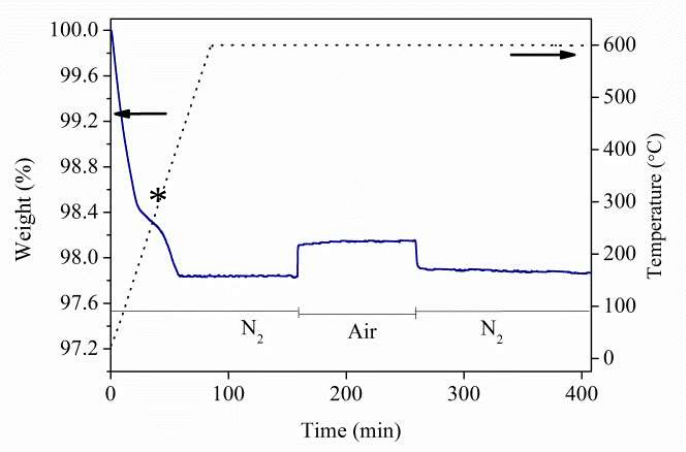

Figure S1. TGA curve of $Ce_{0.65}Pr_{0.20}Cu_{0.15}O_{2-\delta}$ heated to 600 °C in N_2 before switching to air then back to N_2. The large weight loss of ~98.4% until~200 °C, as shown by the asterisk, is attributed to absorbed water.

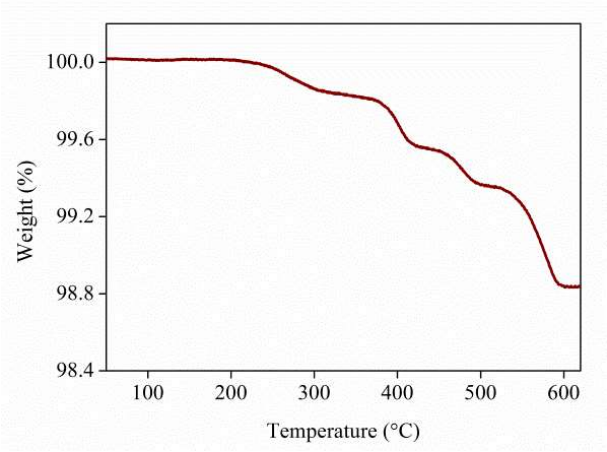

Figure S2. TGA profile of $PrO_{2-\delta}$ when heated under a flow of N_2 showing weight losses occur at temperatures greater than 250 °C.

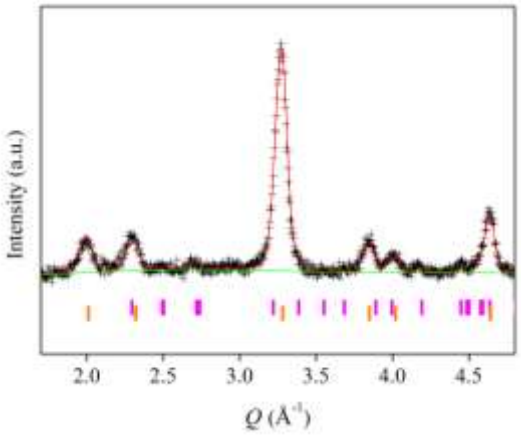

Figure S3. Neutron diffraction pattern of 15% Cu-doped Pr-CeO_2 with CeO_2 (space group $Fm\bar{3}m$) reflections shown by the orange markers and CuO (space group $C2/c$) with pink markers.

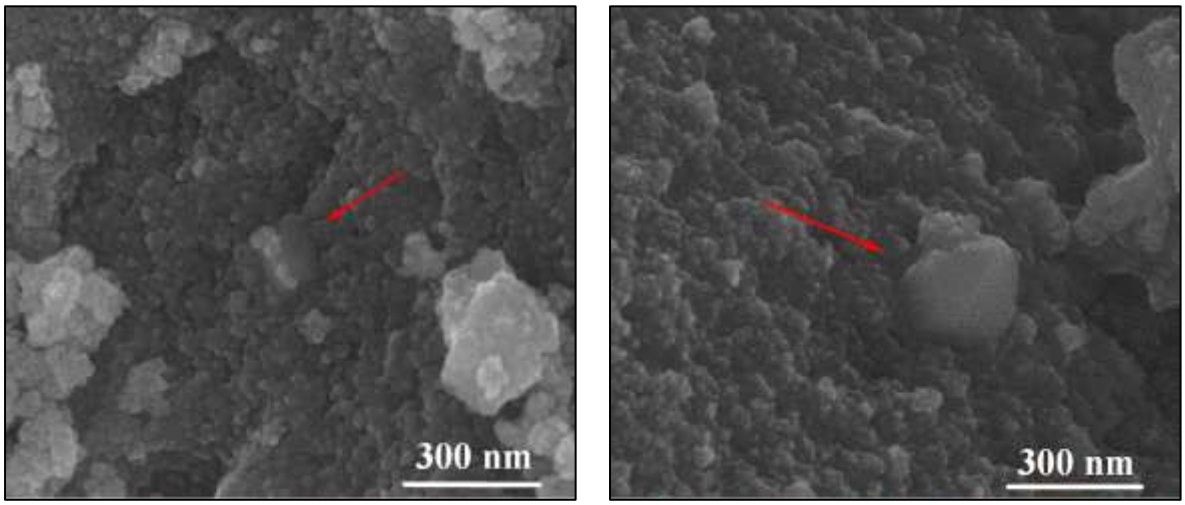

Figure S4. SEM images of 10% Cu-doped Pr-CeO_2 showing the presence of larger faceted CuO crystals.