

Supplementary Information

Synthesis of Phase Pure Praseodymium Barium Copper Iron Oxide

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Experimental Details:

Synthesis of PrBCFO:

A precursor stock solution was prepared from a mixture of 0.5 mmol of praseodymium, barium, copper nitrates and iron (II) acetate salts, all dissolved in 10 mL of dilute nitric acid. All metal nitrates and acetates (Reagent grade) and dextran were purchased from Sigma-Aldrich UK. None of the materials required further purification and were used as received.

1 mL of the dil. nitric acid mixture was dissolved in 10 mL of dextran solution (prepared by the dissolution of 1 g dextran, Mr~70,000 in 50 mL of deionized water). The stirred mixture was allowed to dry overnight at 60 °C and later annealed at 920 °C for 2 h. The control experiment proceeded without the use of dextran solution and 1 mL of the dil. Nitric acid mixture was added to 10 mL of deionized water. For all high temperature heating stages, the furnace used was a Carbolite front loading furnace model ELF11/6b/ with 301 PID digital control. All calcinations were carried out under ambient conditions.

Characterisation:

PXRD patterns were obtained using a Bruker D8 Advance X-ray powder diffractometer with a CuK α X-ray source ($\lambda = 1.5405 \text{ \AA}$). Measurements were recorded for 2θ values from 15.00° to 70.00°, with step sizes of 0.020°. The patterns were indexed using the EVA program. Samples for Scanning Electron Microscopy (SEM) were coated with silver and analyzed using a JEOL JSM 5600 LV equipped with an Oxford Energy Dispersive X-ray (EDX) detector. Transmission Electron Microscope (TEM) samples were prepared by dispersion in absolute ethanol followed by 15 minutes sonication before dropping onto a carbon coated copper grid with a micropipette. TEM analysis was carried out using JEOL JEM 1200EX and JEOL JEM 2010 microscopes equipped with an energy dispersive X-ray (EDX) detector (Oxford Instruments). Fourier Transform Infra-red (FT-IR) spectra

were obtained by using a Fourier Transform Infrared Spectrometer (Spectrum One, Perkin Elmer). The Branauer Emmett Teller (BET) surface area analysis was performed by nitrogen sorption method (at 77 K). Samples were placed in the cell and evacuated at 150 °C for 8 h under an applied vacuum pressure of 10^{-7} mbar. The BET surface area was calculated using data points within $\rho/\rho_0 < 0.1$. Magnetic susceptibility measurements were performed using the Quantum Design Magnetic Property Measurement System (MPMS) SQUID magnetometer equipped with a 5 T superconducting magnet. All curves were measured as field cooling curves under a constant field of 150 Oe.

Supplementary Figures:

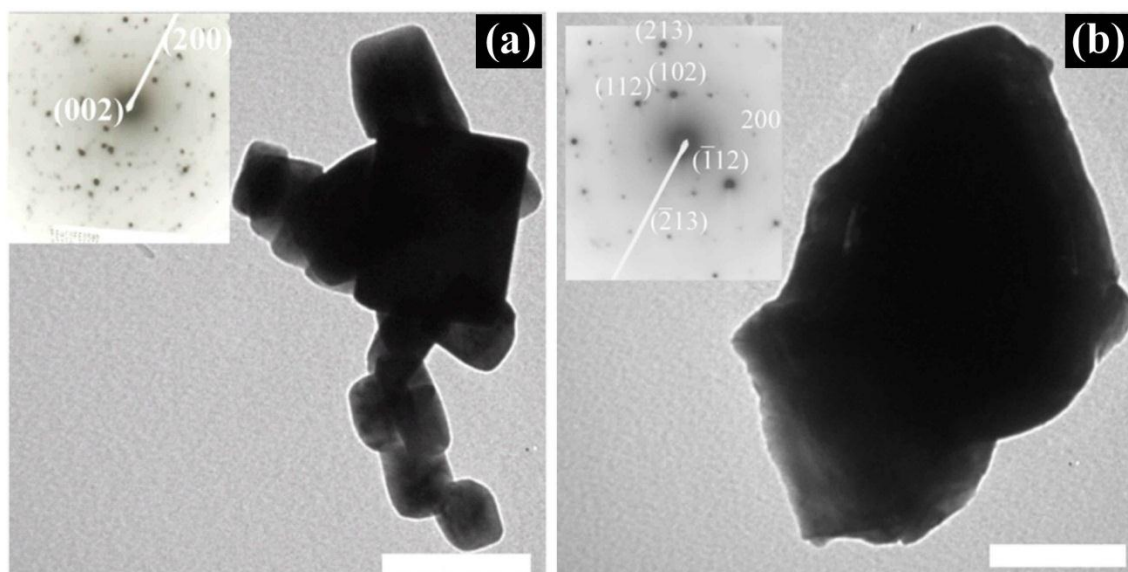


Fig. S1 - TEM micrographs and SAEDs (inset) of (a) control and (b) PBCFO samples. Scale bars in both images are 200 nm.

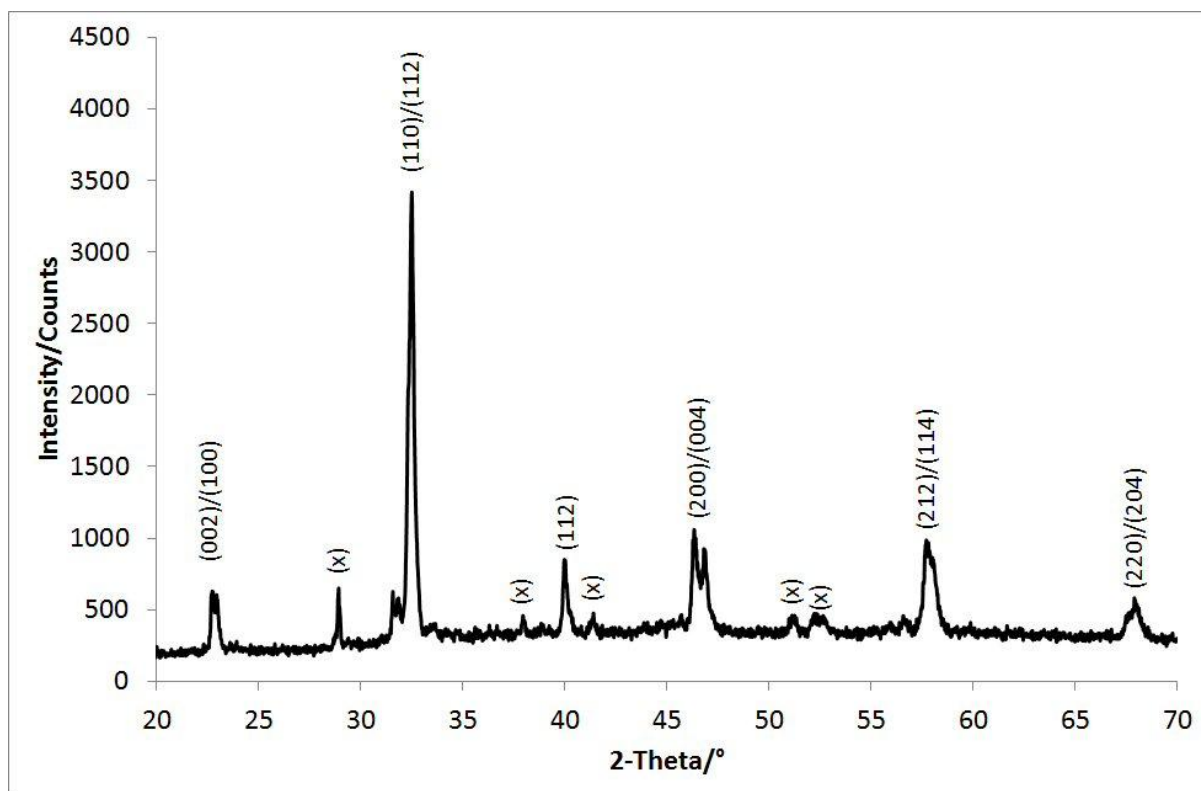


Fig. S2 – PrBCFO synthesized using EDTA/citrate method. Impurity phases are marked with (x).
Synthesis was based on the protocol by Shao *et al.*, *J. Alloy & Comp.*, 2010, **491**, 271.

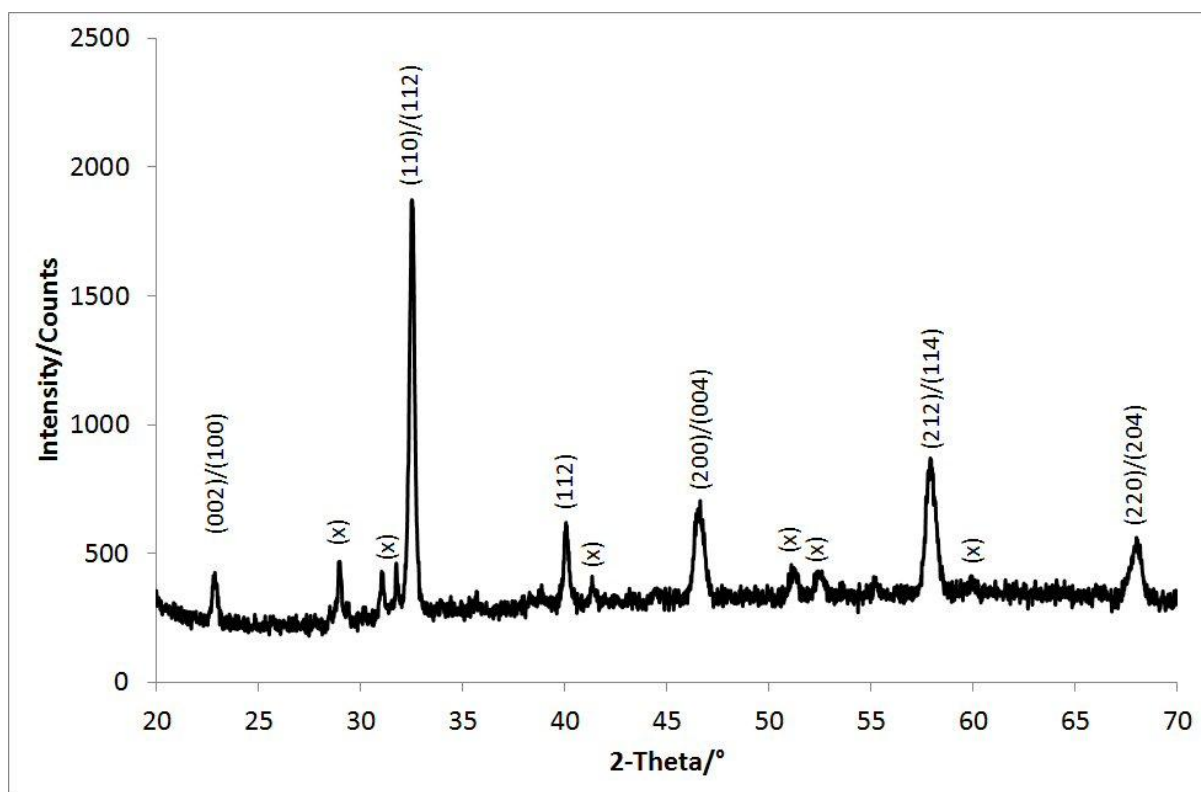


Fig. S3 – PrBCFO synthesized using nitrate/glycine method. Impurity phases are marked with (x).
Synthesis was based on the protocol by Exarhos *et al.*, *Mater. Lett.*, 1990, **10**, 6.