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High Performing Triple-Conductive $Pr_2NiO_{4+\delta}$ Anode for Proton-Conducting Steam Solid Oxide Electrolysis Cell

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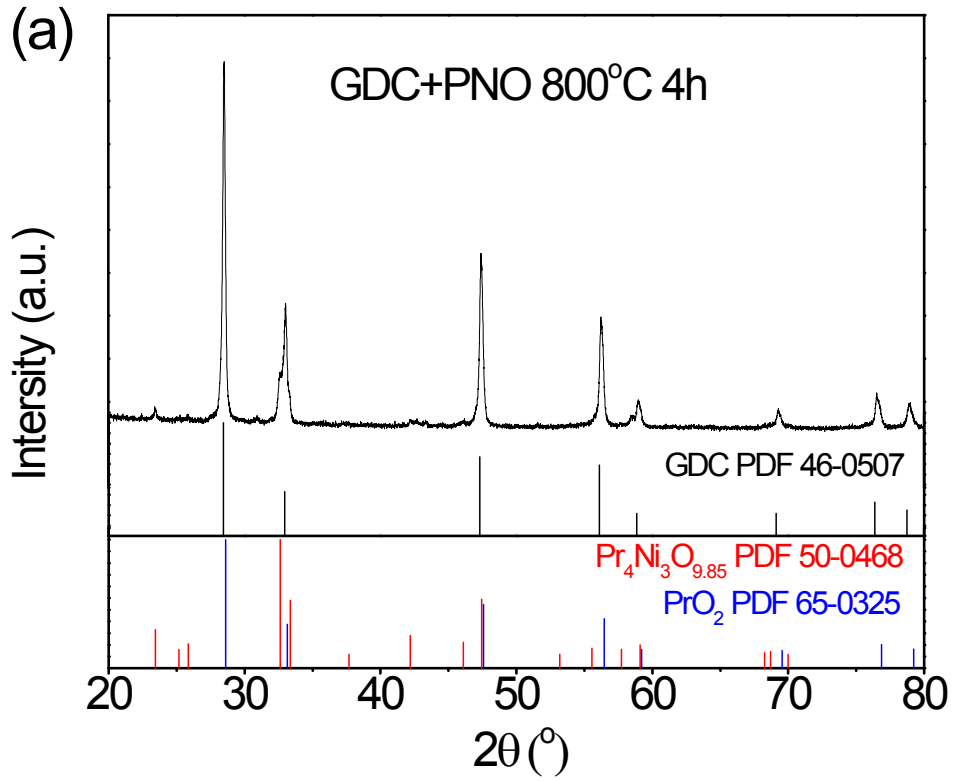
Supporting materials



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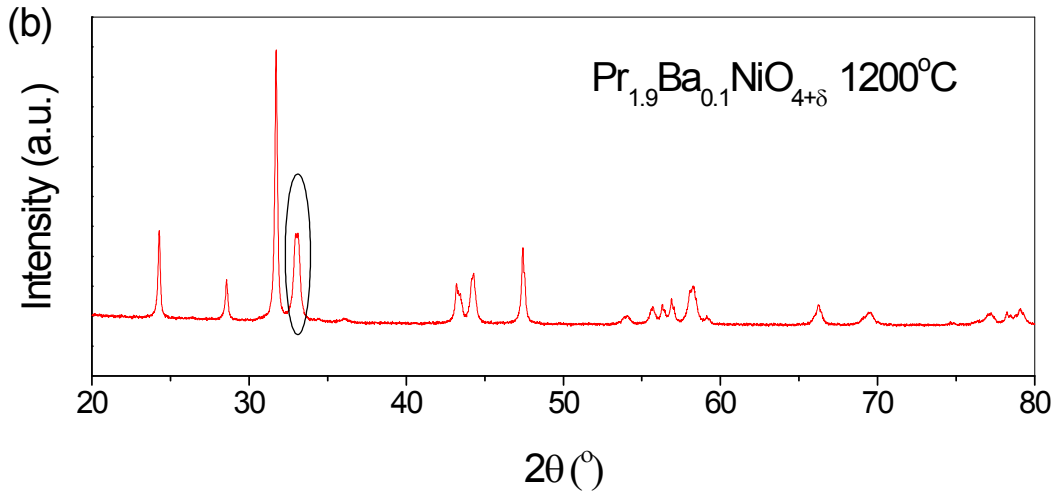


Fig. S1 (a) Interaction between PNO and GDC after heating at 800°C for 4h. Instead of symmetry change from orthorhombic to tetragonal, the $A_{n+1}B_nO_{3n+1}$ RP phase evolves from low order to high order form, accompanied by release of simple praseodymium oxide, (b) orthorhombic to tetragonal symmetry transition when 5% Ba is doped at A site, note that the double peak at 33° in orthorhombic turns to single peak in the tetragonal symmetry.

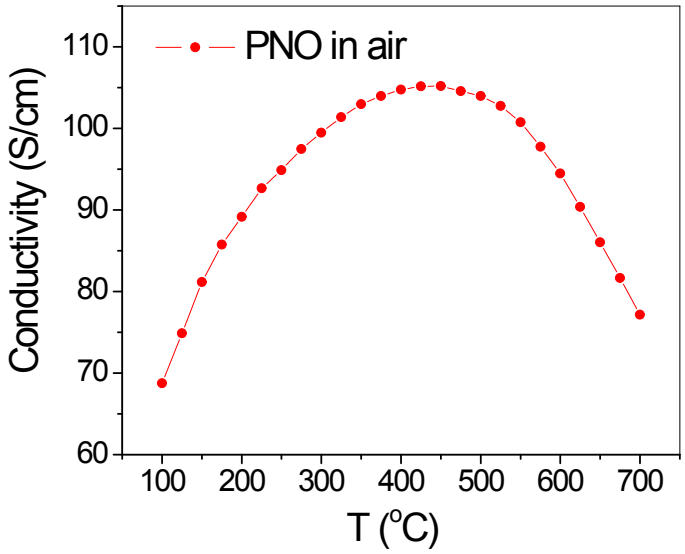


Fig. S2 electrical conductivity of PNO measured in dry air.

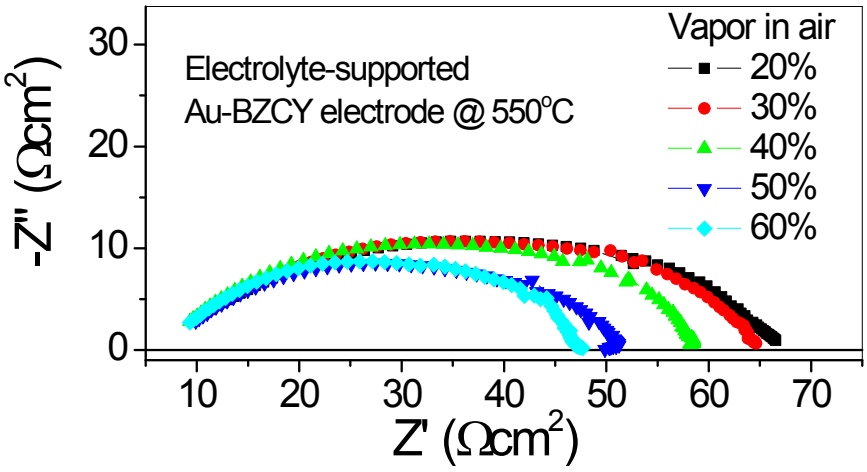


Fig. S3 Progressively decreasing polarization resistance of inert Au-BZCY electrode on BZCY electrolyte, measured in parallel experiment with PNO. No resistance saturation was observed.

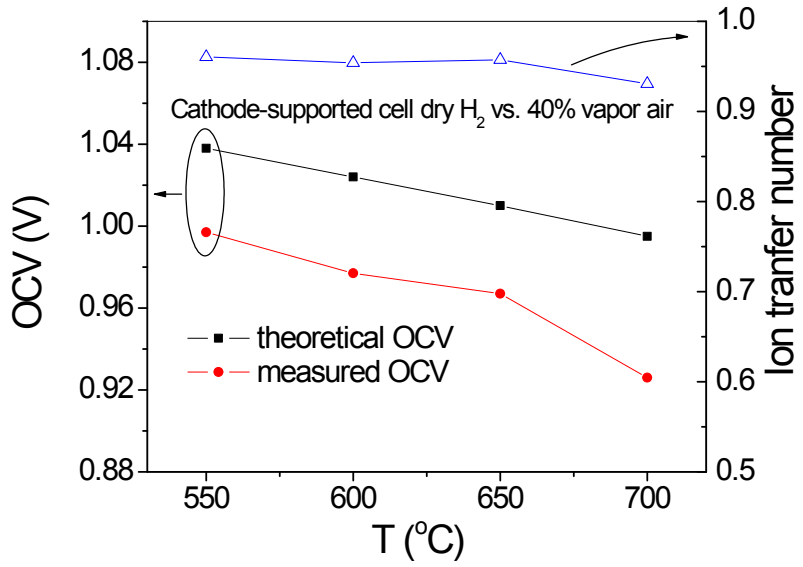


Fig. S4 Measured and calculated OCV of the cathode-supported full cell, the ion transport number is around 95%, proving negligible electronic and gas leakage through the thin BZCY electrolyte layer.

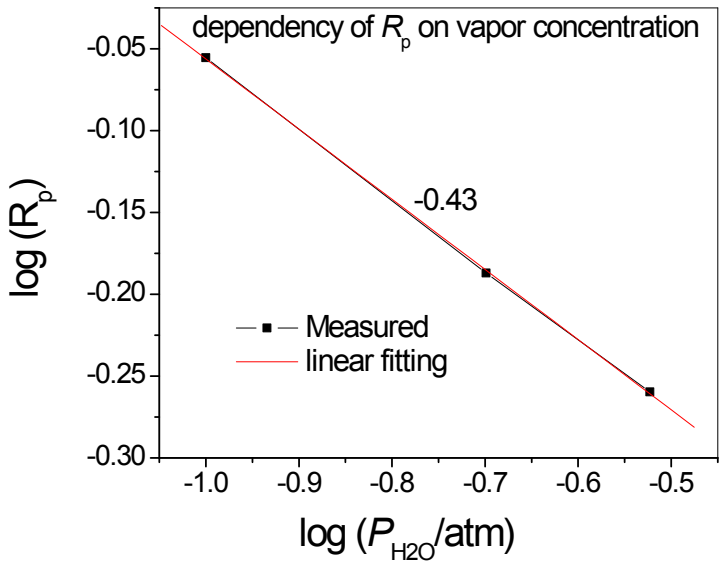
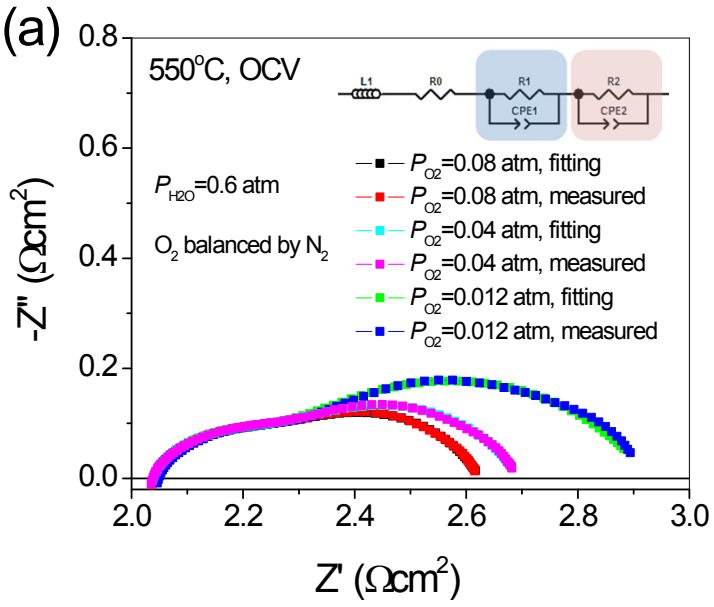
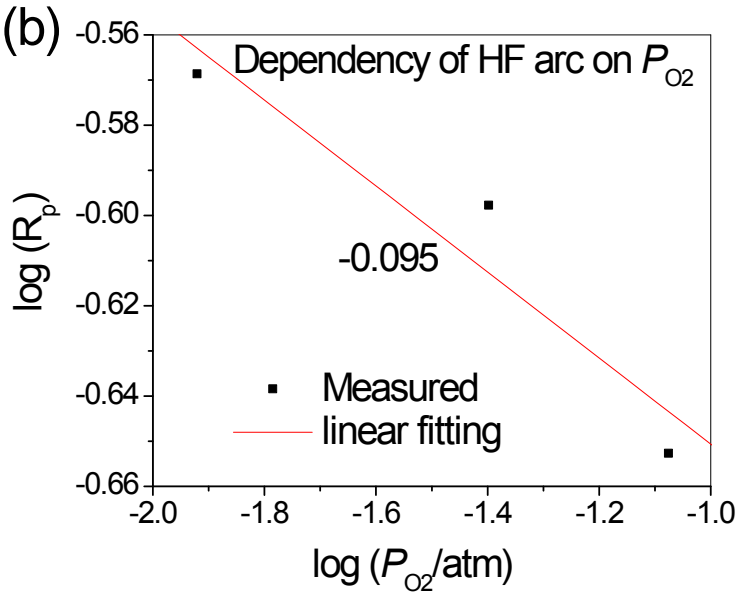


Fig. S5 Dependency of polarization resistance of PNO-BZCY anode on P_{H2O} at 550°C measured at OCV.





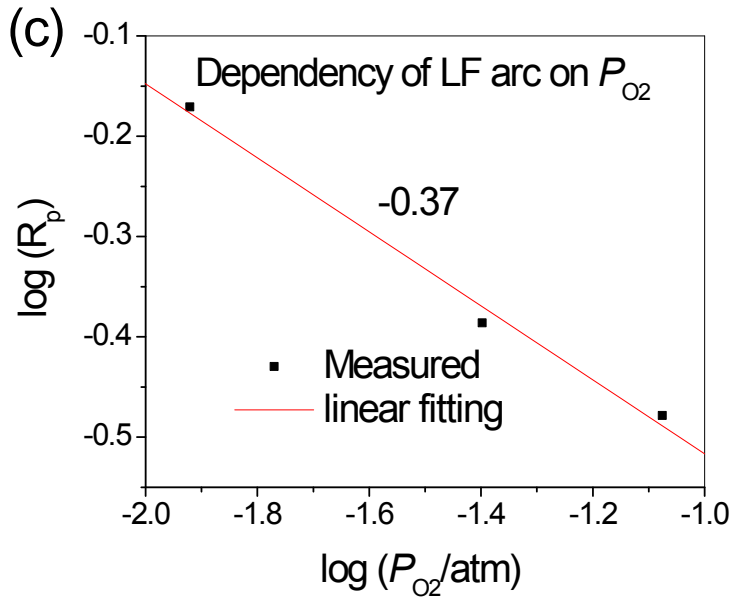


Fig. S6 (a) Measured and fitted EIS of PNO-BZCY anode in 60% vapor with varying P_{O2} at 550^{o}C under OCV, these spectra are fitted into a two-arc profile using the equivalent circuit in the inset; (b) reaction order of the fitted HF arc resistance on P_{O2}; (c) reaction order of the fitted LF arc resistance on P_{O2}