

**A novel in-situ diffusion strategy to fabricate high performance  
cathode for low temperature proton-conducting solid oxide fuel cells**

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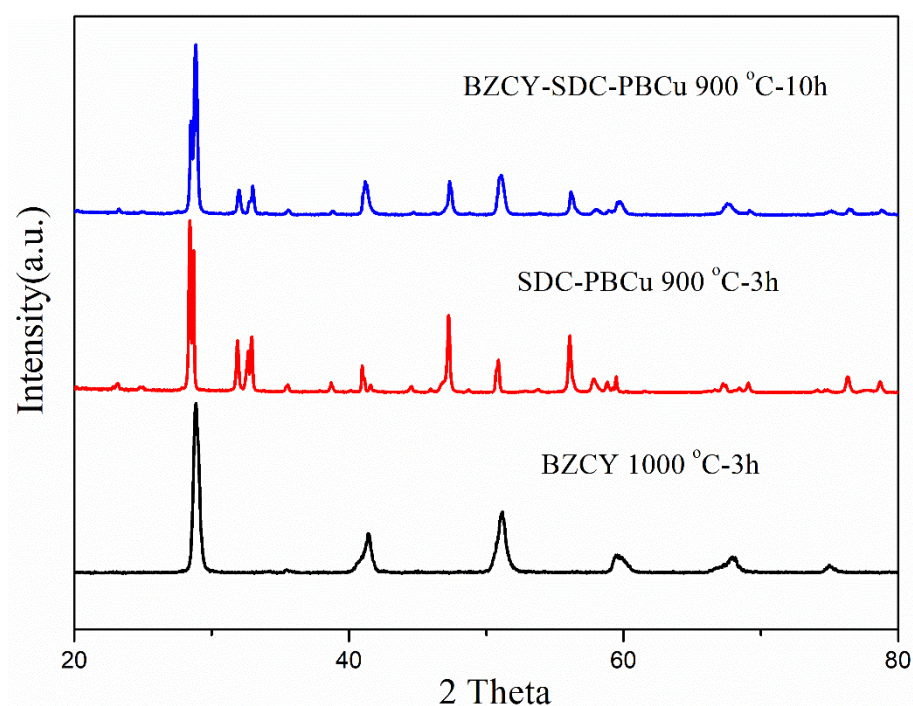


Figure S1 XRD patterns of BZCY fired at 1000 °C for 3 h, the dry-mixed composite powder SDC-PBCu fired at 900 °C for 3 h and then mixed with BZCY forming BZCY-SDC-PBCu composite annealing at 900 °C for 10 h, respectively.

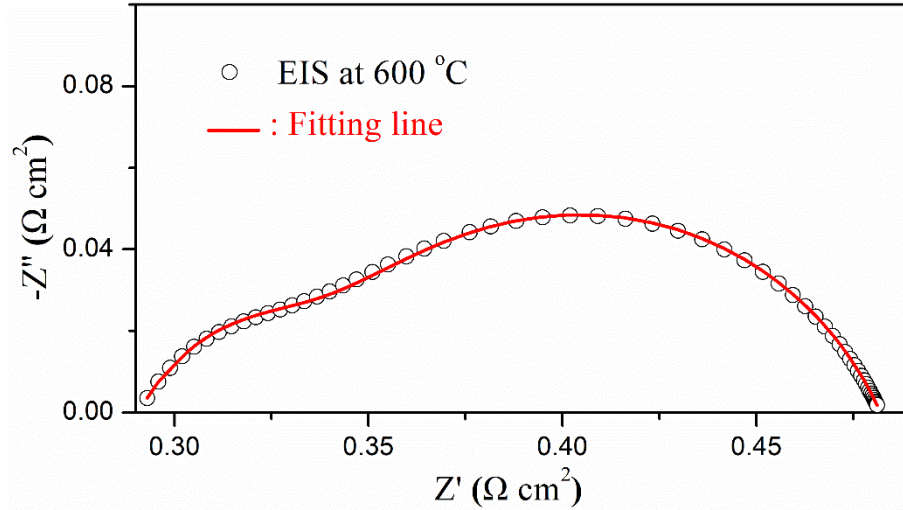


Figure S2 The electrochemical impedance spectra (EIS) of the single cell measured at 600 °C under open circuit conditions, and the line is the fitting result.

The fitting of the EIS at 600 °C have been selected to illustrate the data reliability of the cell resistance. The equivalent circuit was made of a resistance (R) associated in series with two distributed elements, composed by a constant phase element (CPE) in parallel with a resistance, which was added in the revised manuscript. The typical EIS plot at 600 °C with PDC-BCC-SBCC-CuO cathode obtained under open-circuit condition was fitted with the equivalent circuit  $R(R_H Q_H)(R_L Q_L)$ , in which R and Q represents the resistance and CPE. The fitting results are shown in Figure S2. Seen from Figure S2, the fitting result well matches with the EIS testing data. And the fitting results of the  $R_o$ ,  $R_H$  and  $R_L$  are 0.29295, 0.042217 and 0.146  $\Omega \text{ cm}^2$  which is almost identical with the experimental results obtained in this work that are 0.293  $\Omega \text{ cm}^2$  for  $R_o$  value and 0.188  $\Omega \text{ cm}^2$  for  $R_p$  value that is the sum of  $R_H$  and  $R_L$ . Based on the EIS fitting result, using the intercepts to calculate  $R_p$  and  $R_o$  does not result in large deviation and this method to estimate the  $R_o$  and  $R_p$  values is precise and reasonable in this work.

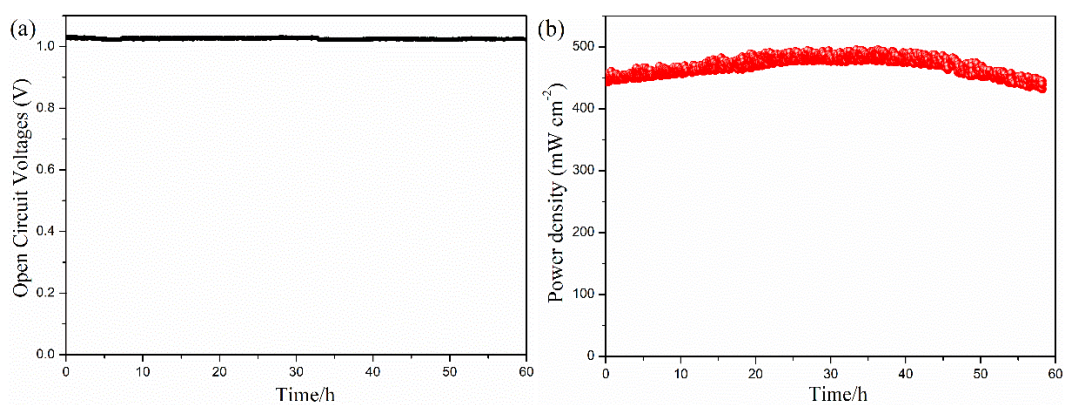


Figure S3 Long-term stability of the single cell with PDC-BCC-SBCC-CuO as the cathode based on  $\text{BaZr}_{0.1}\text{Ce}_{0.7}\text{Y}_{0.2}\text{O}_{3-\delta}$  electrolyte under (a) OCV and (b) the cell voltage of 0.7 V at 600 °C with hydrogen (3%  $\text{H}_2\text{O}$ ) as the fuel.