Electronic supplementary materials for

Compositional engineering of perovskite oxide $BaCo_{0.5}Fe_{0.5}O_{3-\delta}$ as an efficient bifunctional electrocatalyst for rechargeable zinc-air battery

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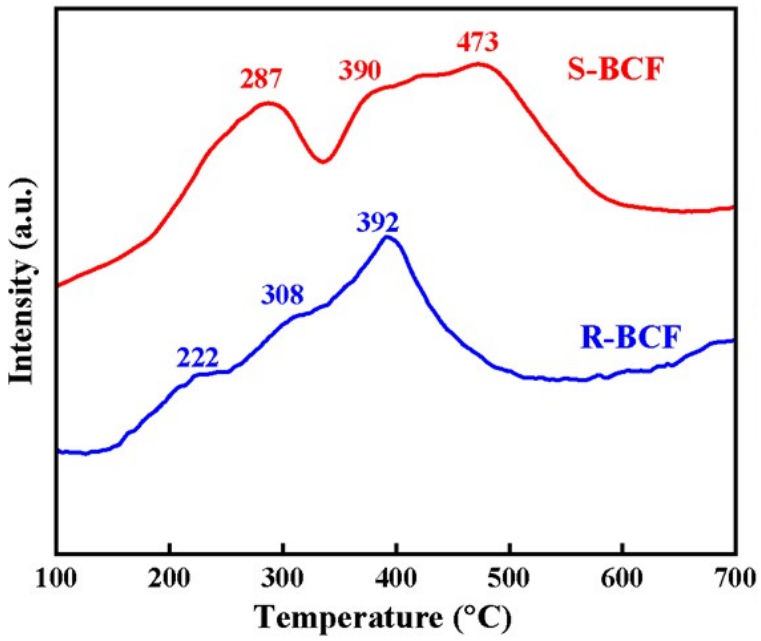

Fig. S1 The measured H_2-TPR curves for R-BCF catalyst and S-BCF catalyst.

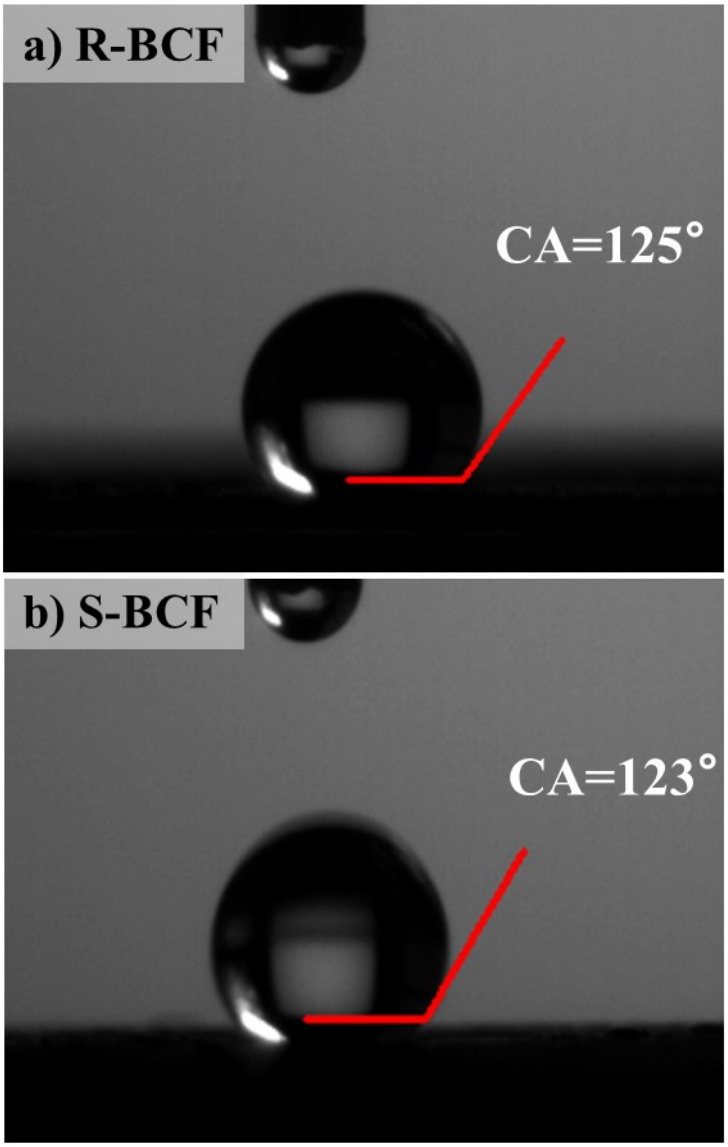

Fig. S2 Water contact angle photographs for (a) R-BCF cathode and (b) S-BCF cathode.

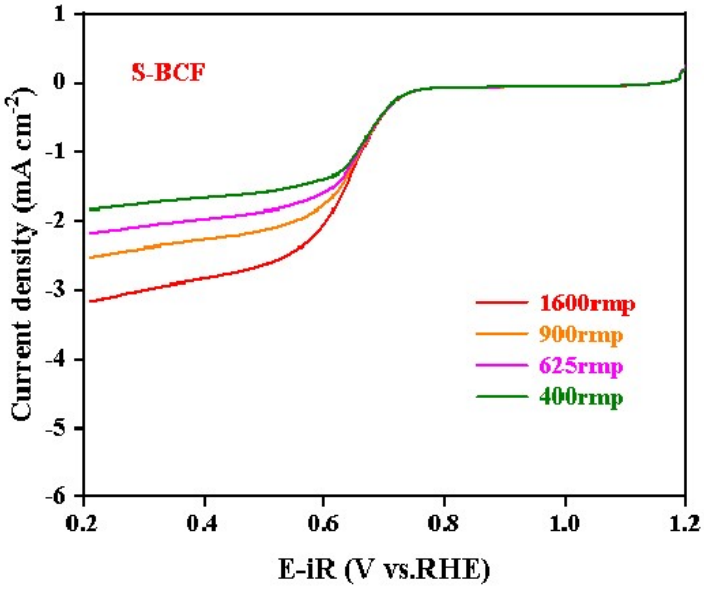

Fig. S3 LSV curves of S-BCF catalyst measured at different rotating rates (400, 625, 900, and 1600 rmp).

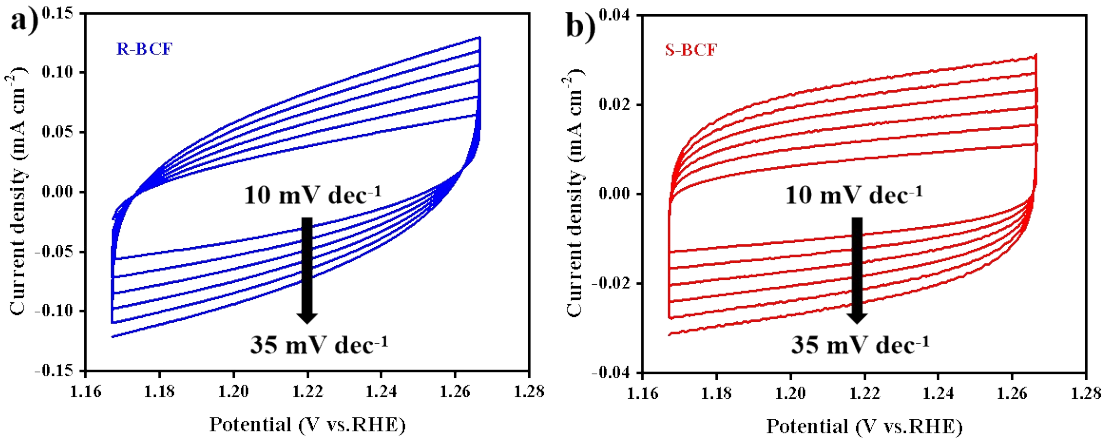

Fig. S4 CV curves of (a) R-BCF catalyst, and (b) S-BCF catalyst.

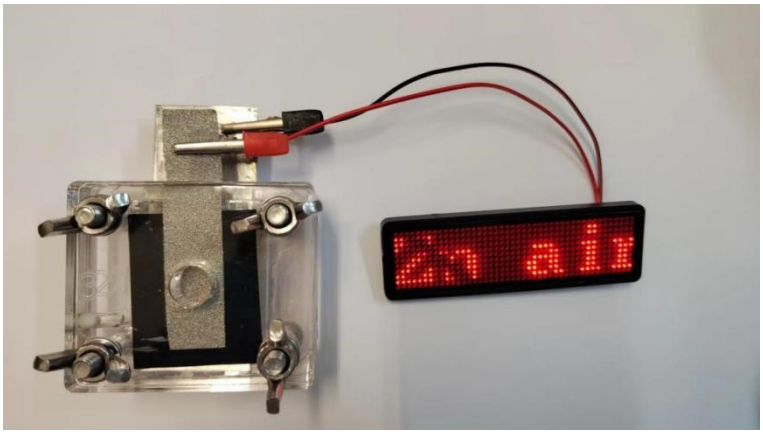

Fig. S5 Photograph of a light-emitting diode (LED) with the "Zn air" logo, powered by a ZAB based on R-BCF catalyst.

Table S1 The summarized manufacturers of the chemicals and materials used for electrochemical performance measurements

Chemicals	Manufacturer
Pt/C	Suzhou Sinero Technology Co
RuO_2	Suzhou Sinero Technology Co
Carbon paper	Changsha Sipulin New Energy Technology Co., Ltd
6M KOH solution	Shanghai Aladdin Biochemical Technology Co., Ltd.
$C_4H_6ZnO_4$	Shanghai Aladdin Biochemical Technology Co., Ltd.
Zn metal	Changsha Sipulin New Energy Technology Co., Ltd

Table S2 The deconvolution results of O*1s*, Fe*2p* and Co*2p* XPS peaks of R-BCF and S-BCF materials

Sample	O_{ad} (at. %)	Fe^{2+}(at. %)	Co^{3+}(at. %)	Co^{3+}/Co^{2+}	Co/Fe
R-BCF	51.0	58.0	83.0	4.88	1.37
S-BCF	41.5	61.0	82.0	4.56	1.52

Table S3 Comparison of the peak output power density (p_{max}) of the synthesized catalysts and the recently reported materials loaded on ZABs

Catalysts	p_{max} (mW cm^{-2})	Ref
S-BCF	81	This study
R-BCF	132	This study
$La_{0.85}Y_{0.15}Ni_{0.7}Fe_{0.3}O_3$	93.6	S1
$La_{0.68}Sr_{0.3}Co_{0.95}O_{2.73}$	34.4	S2
$La_{0.7}Sr_{0.3}Co_{0.9}Pd_{0.03}O_{2.85}$	52.4	S2
$(La_{0.8}Sr_{0.2})_{0.95}Mn_{0.5}F_{e0.5}O_3$	105	S3
$Mn_{0.5}Ni_{0.5}Co_2O_4$	117	S4
$(La_{0.65}Sr_{0.3})_{0.95}FeO_{3-\delta}$	93	S5
Sr_2TiMnO_6	97	S6
$PrBa_{0.5}Sr_{0.5}Co_{1.5}Fe_{0.5}O_{5+\delta}$	109	S7
$PrBa_{0.5}Sr_{0.5}Co_{1.5}Fe_{0.5}O_{5+\delta}$ Nanofiber	127	S7
$LaMn_{0.75}Co_{0.25}O_{3-\delta}$	35	S8
$Sr_2Fe_{1.5}Mo_{0.5}O_{6-\delta}$ Nanoparticles	107.9	S9
$Ba_{0.5}Sr_{0.5}Co_{0.8}Fe_{0.2}O_{3-\delta}$	156.2	S10
$Pr_{0.5}Ba_{0.5}CoO_{3-\delta}$	175	S11

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