Supporting information

Unveiling the critical role of W doping in enhancing oxygen reduction activity of $SrCo_{0.7}Fe_{0.3}O_{3-\delta}$ cathode for intermediate temperature SOFCs

Qian Wang[a,b], Guanghu He[a,*], Xinkun Zhou[a,c], Wenyuan Liang[a], Xiuling Wang[a], Lei Chu[b], Minghua Huang[b,*], Heqing Jiang[a,c,*]

a State Key Laboratory of Photoelectric Conversion and Utilization of Solar Energy, Qingdao New Energy Shandong Laboratory, Qingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences, Qingdao, China

b School of Materials Science and Engineering Ocean University of China, Qingdao, China

c University of Chinese Academy of Sciences, Beijing 100049, China

Corresponding authors:
hegh@qibebt.ac.cn
huangminghua@ouc.edu.cn
jianghq@qibebt.ac.cn

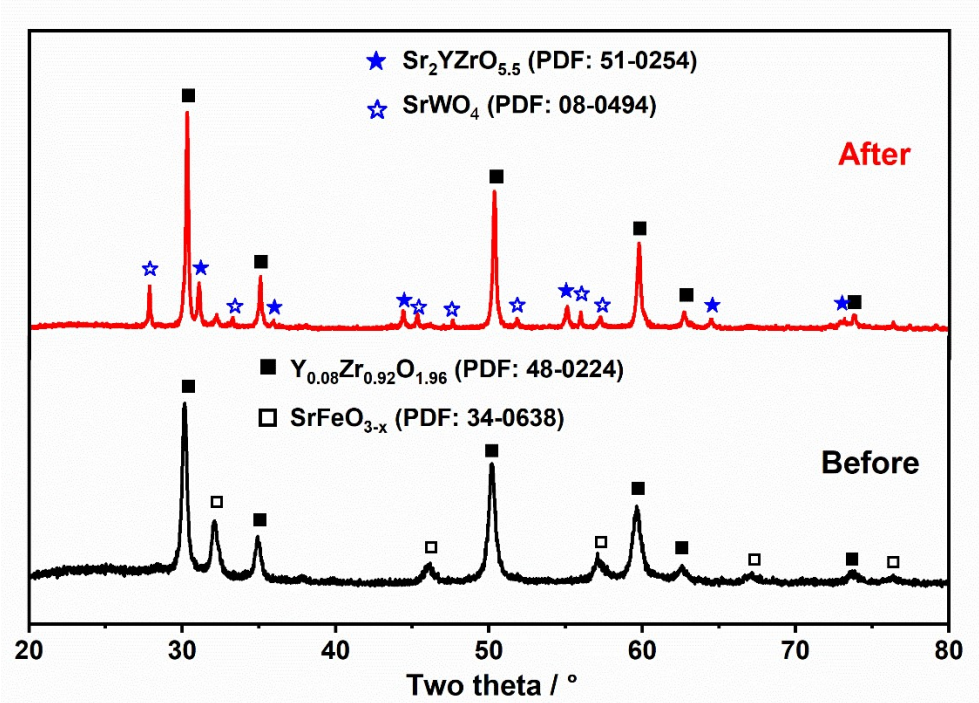

Figure S1: XRD patterns of SCFW-0.1 and YSZ powders before and after calcination at 1000 °C for 10h

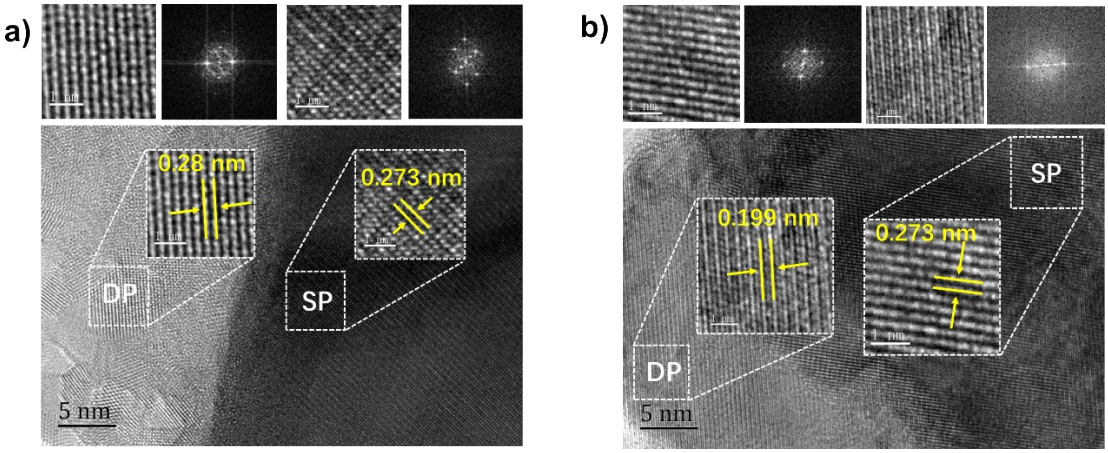

Figure S2. HRTEM images of a) SCFW-0.1 and b) SCFW-0.15 oxide.

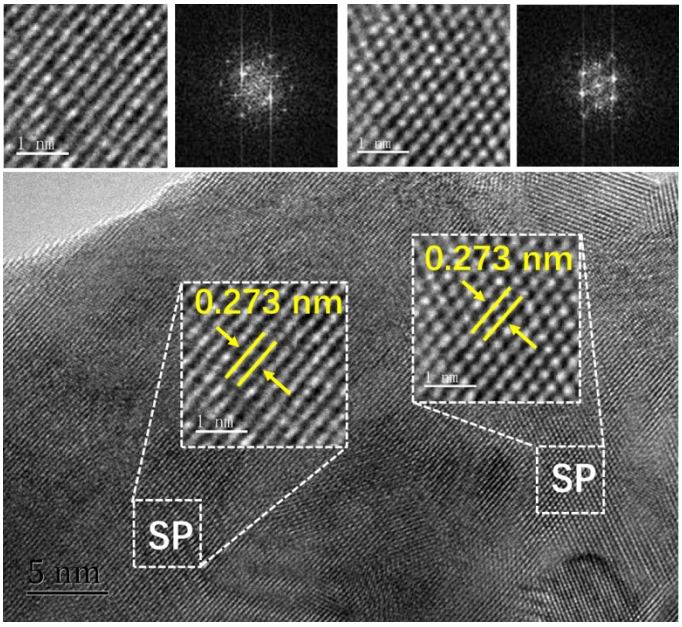

Figure S3. HRTEM images of SCF oxide.

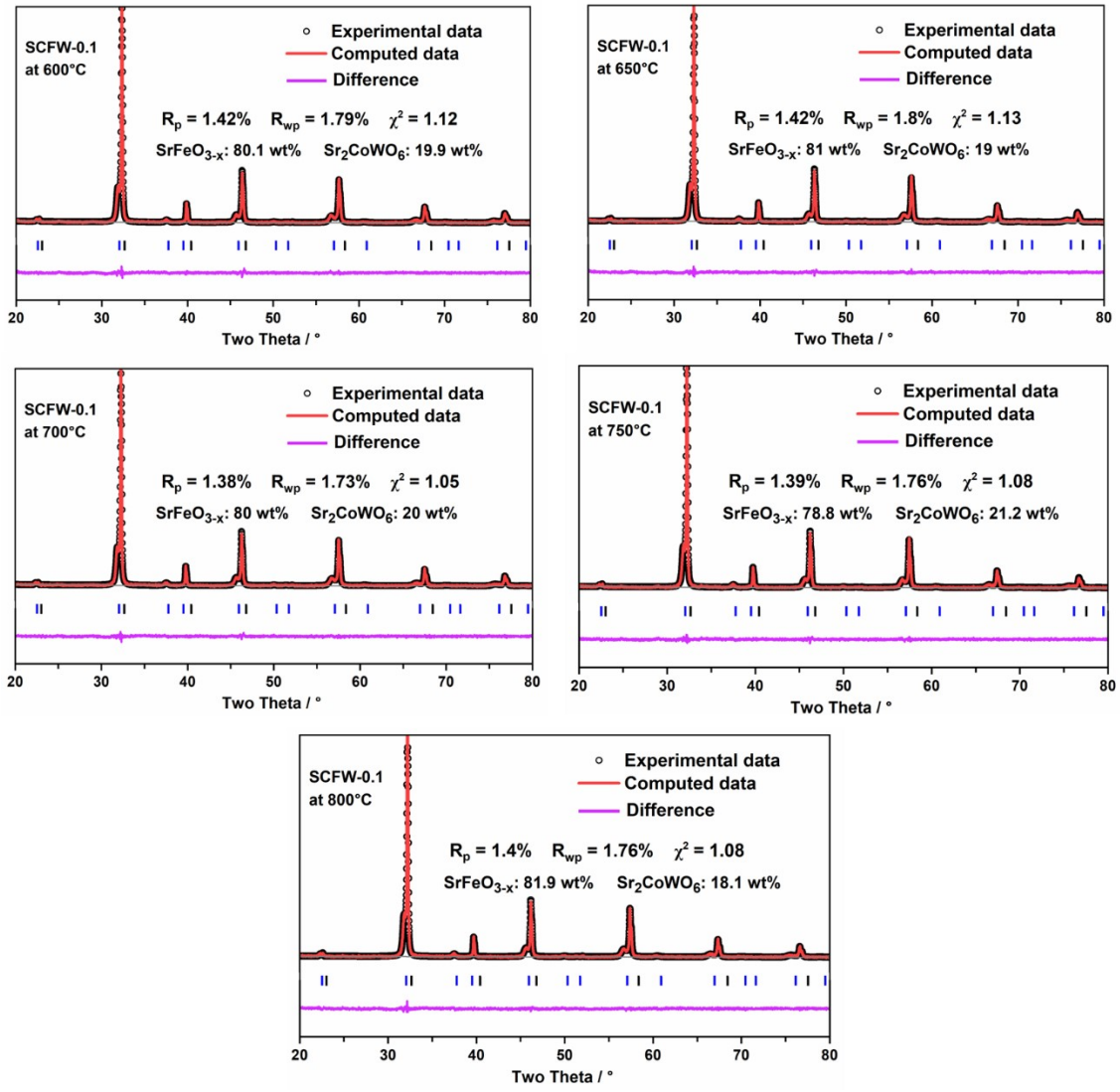

Figure S4. Refined XRD patterns of SCFW-0.1 oxide at 600 – 800 °C.

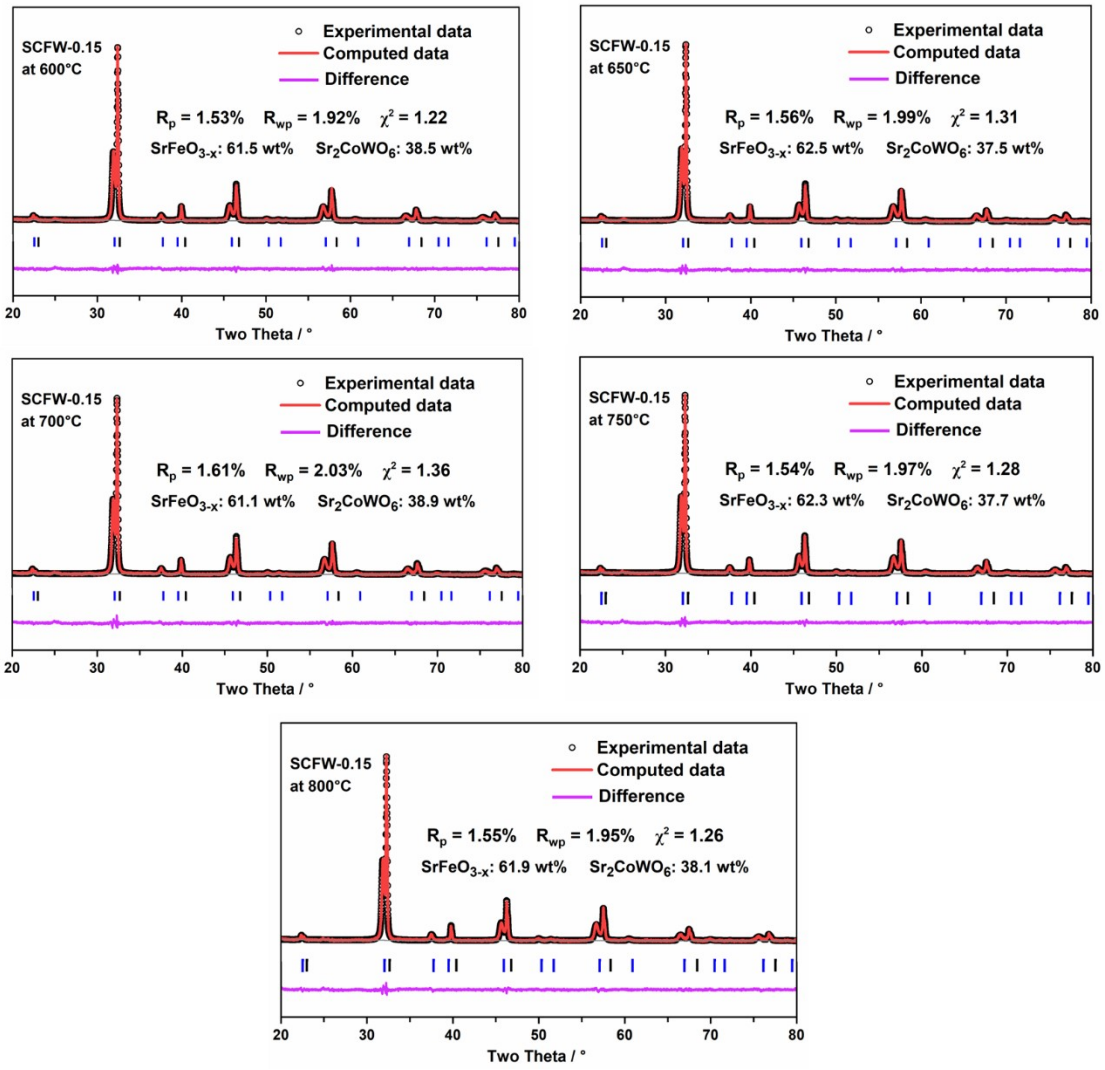

Figure S5. Refined XRD patterns of SCFW-0.15 oxide at 600 – 800 °C.

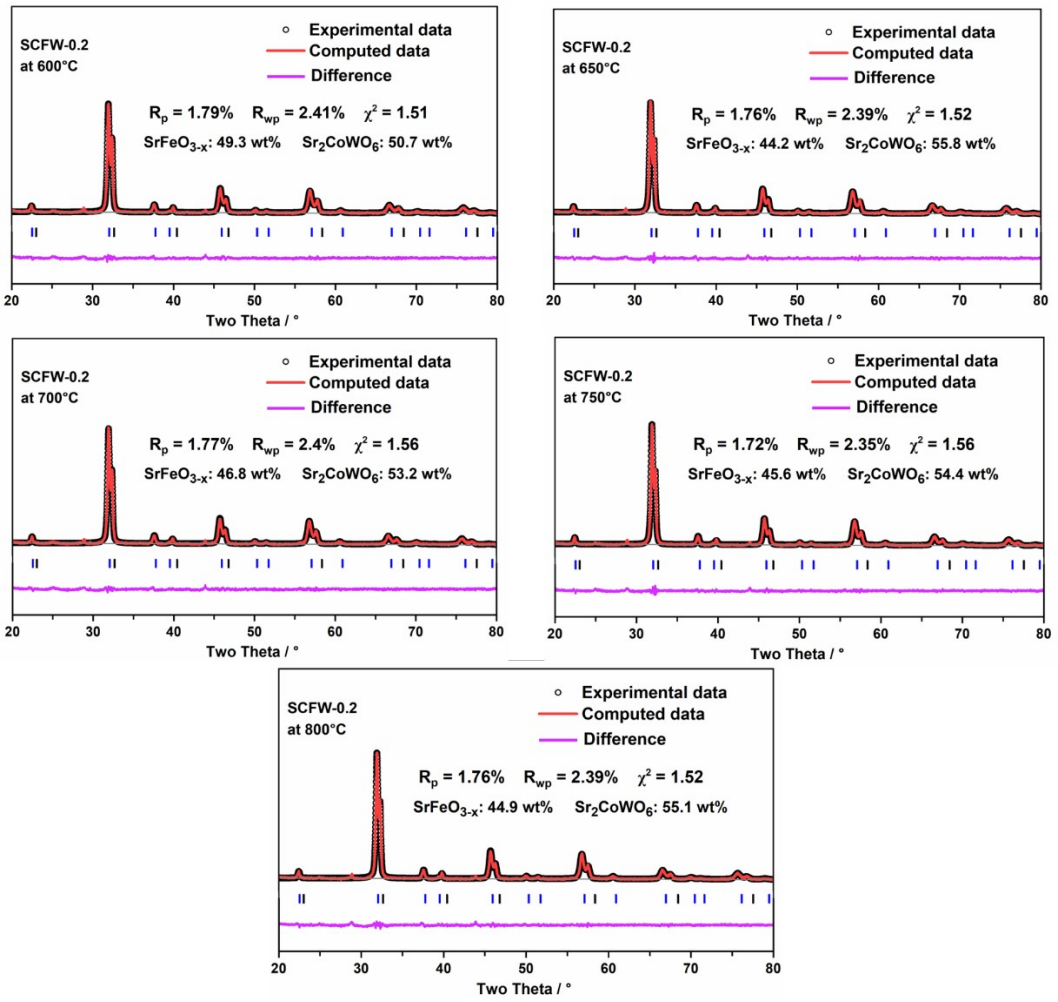

Figure S6. Refined XRD patterns of SCFW-0.2 oxide at 600 – 800 °C.

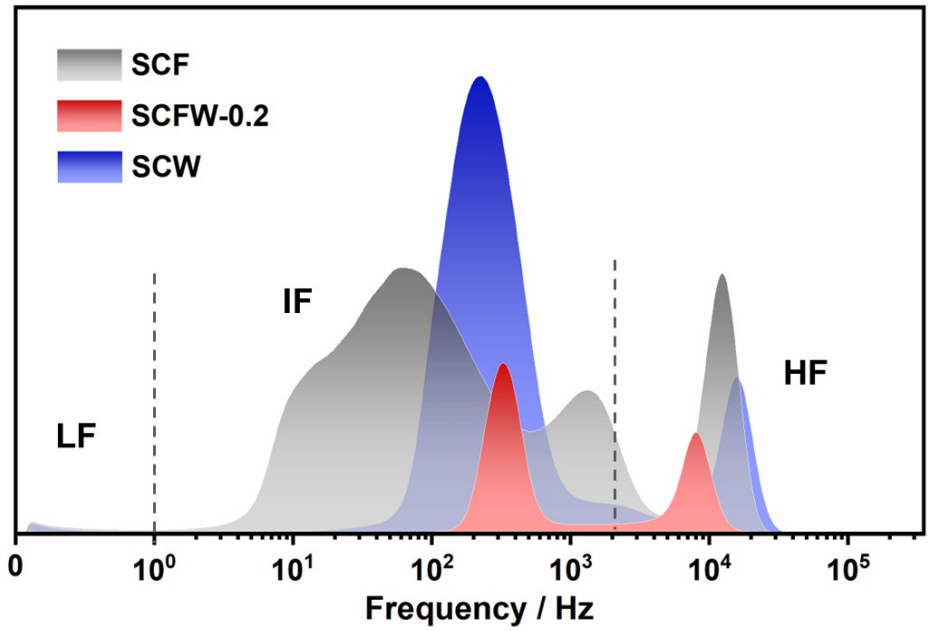

Figure S7. Distribution of relaxation time (DRT) analysis of EIS data for SCF, SCFW-0.2 and SCW oxides

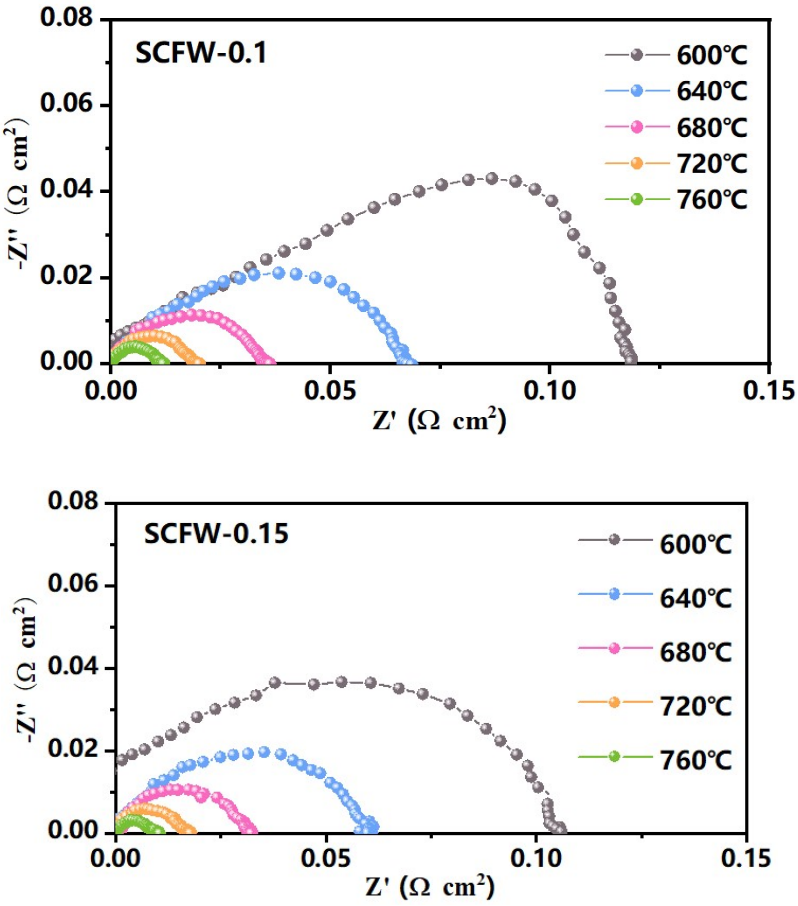

Figure S8. EIS curves of $SrCo_{0.7}Fe_{0.3-x}W_xO_{3-\delta}$ (x=0, 0.1, 0.15, 0.2 and 0.3) electrode at different temperatures

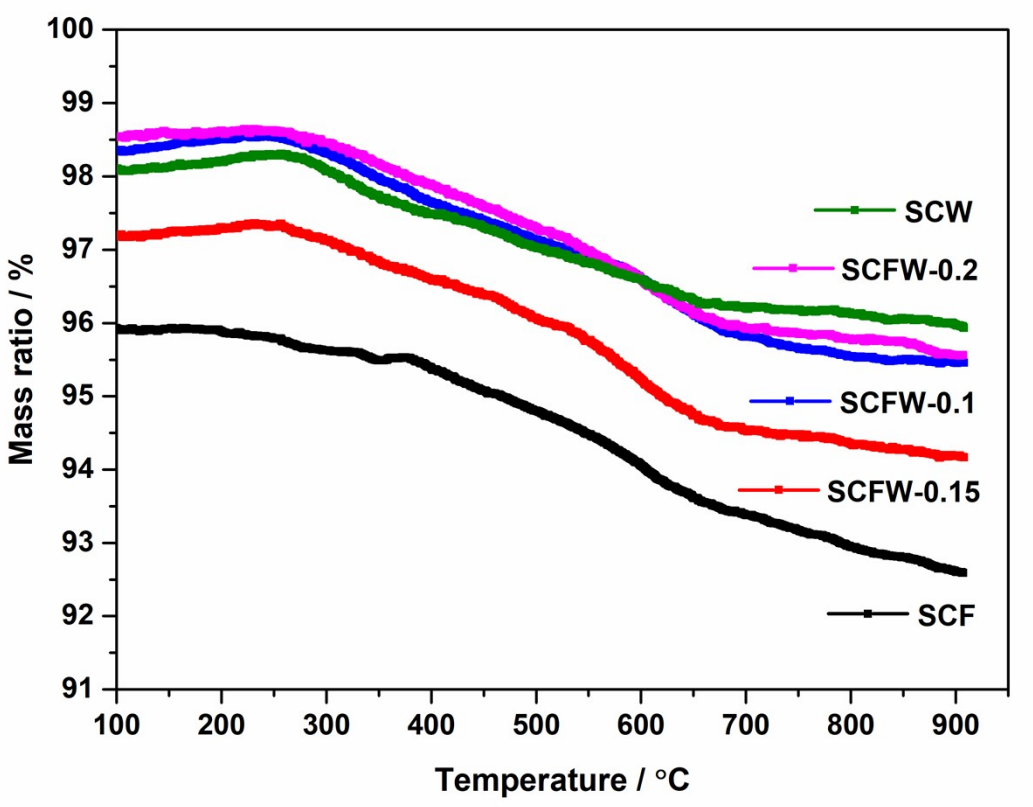

Figure S9. TGA curves of the SCFW oxides.

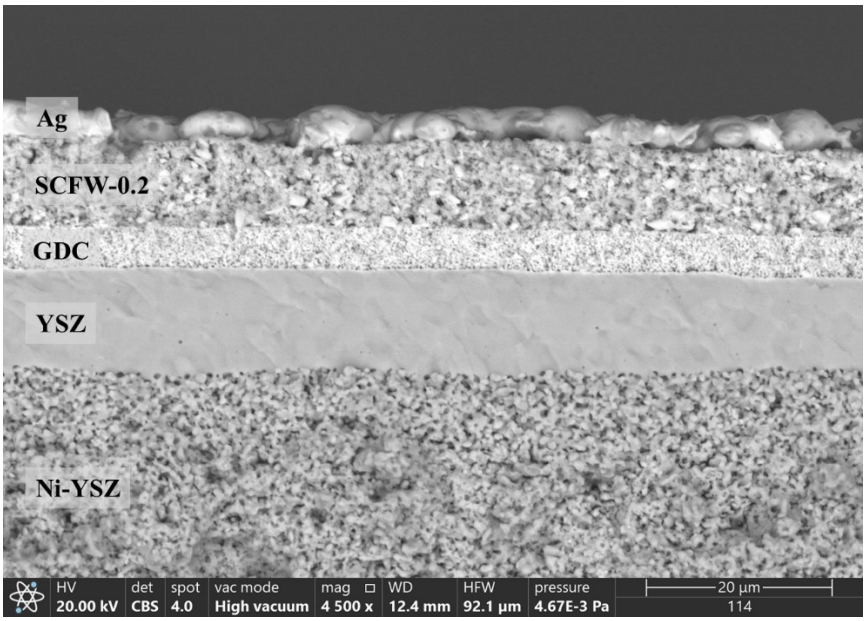

Figure S10. SEM image of the cross-section of the spent cell after 30-h stability test.

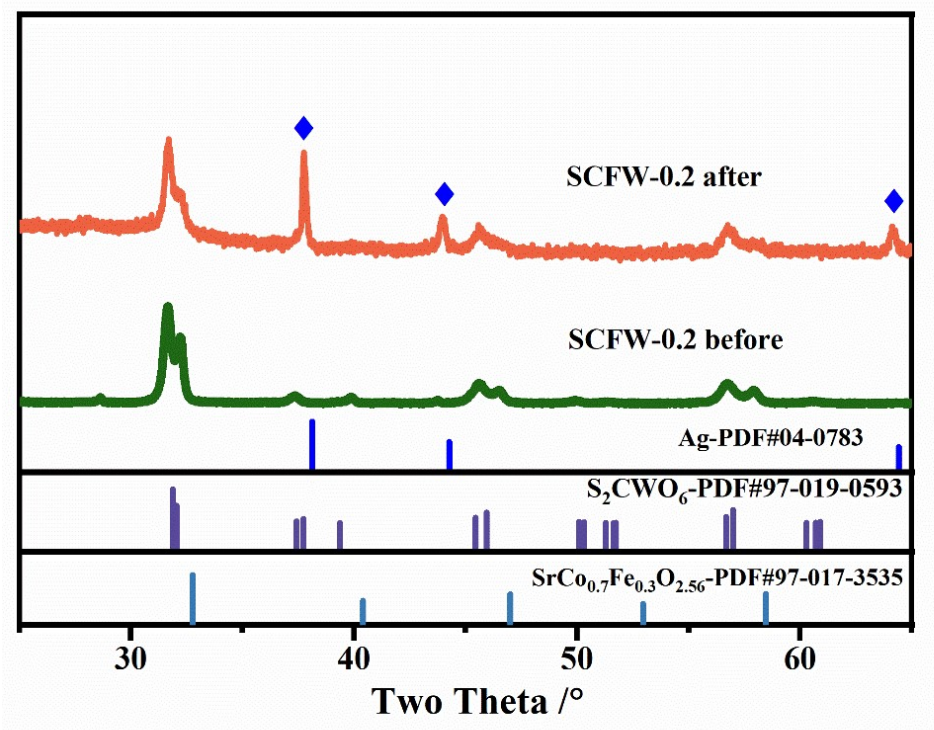

Figure S11. XRD patterns on the SCFW-0.2 cathode of the spent cell after 30-h stability test.

Table S1: The peak power density (PPD) of SCFW-0.2-based SOFC compared with typical perovskite-based SOFC reported in previous literature

Cathode	Electrolyte	Anode	Temp./ °C	PPD / mW cm^2	Ref.
$(Ba_{0.5}Sr_{0.5})_{0.75}Pr_{0.25}Co_{0.575}Fe_{0.3}W_{0.125}O_{3-\delta}$	LSGM	LDC/Ni-GDC	650	430	1
$SmBa_{0.7}Sr_{0.3}Co_2O_{6-\delta}$	SDC	Ni-SDC	700	210	2
$SmBa_{0.5}Sr_{0.5}Fe_2O_{5+\delta}$	LSGM	SDC/NiCu-SDC	650	180	3
$LaBa_{0.5}Sr_{0.5}Fe_2O_{6-\delta}$	SDC	Ni-SDC	650	150	4
$Sr_2Fe_{1.8}W_{0.2}O_{6-\delta}$-GDC	LSGM	$Sr_2Fe_{1.6}W_{0.4}O_{6-\delta}$-GDC	650	150	5
$LaBaFe_{1.925}Nb_{0.075}O_{6-\delta}$	SDC	Ni-SDC	650	255	6
$SrCo_{0.7}Nb_{0.1}Ni_{0.2}O_{3-\delta}$	GDC/YSZ	Ni-YSZ	650	305	7
$CoFe_2O_4$	GDC/YSZ	Ni-YSZ	650	160	8
$SrCo_{0.7}Fe_{0.1}W_{0.2}O_{3-\delta}$	GDC/YSZ	Ni-YSZ	650	285	This work

LSGM: $La_{0.9}Sr_{0.1}Ga_{0.8}Mg_{0.2}O_{3-\delta}$; YSZ: $(Y_2O_3)_{0.08}(ZrO_2)_{0.92}$; GDC: $Ce_{0.9}Gd_{0.1}O_{2-\delta}$; LDC: $Ce_{0.9}La_{0.1}O_{2-\delta}$; SDC: $Ce_{0.8}Sm_{0.2}O_{2-\delta}$

Reference

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