Supporting Information

Evaluating the electronic structure and stability of epitaxially grown Sr-doped $LaFeO_3$ perovskite alkaline O_2 evolution model electrocatalysts

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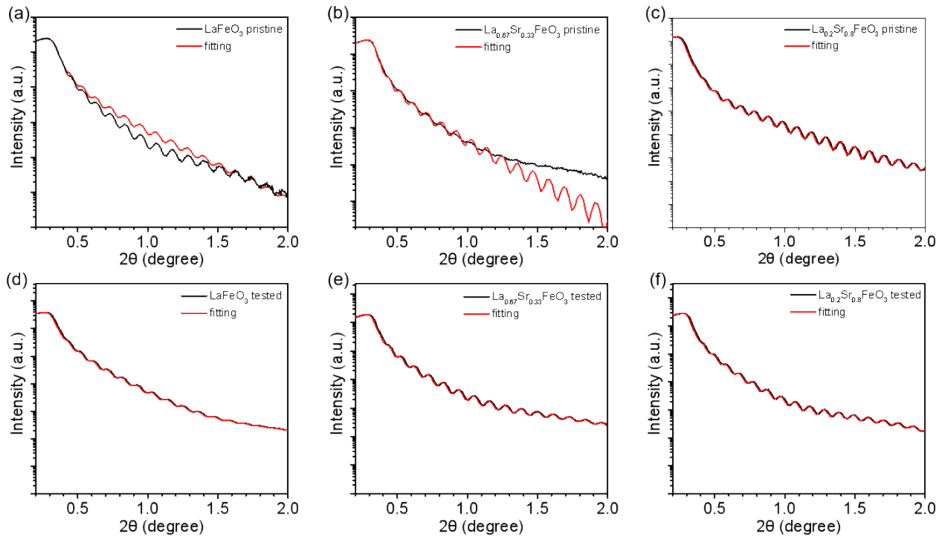

Figure S1. XRR experimental results (black curves) and the corresponding fitted results (red curves). (a) pristine LFO, (b) LSF-0.33 and (c) LSF-0.8. The XRR results of $La_{1-x}Sr_xFeO_3$ (x = 0, 0.33, 0.8) are fitted by the XRR fitting software ANALYSE from RayfleX. The thickness of the layer is correlated to the distance of the Kiessig fringes, which result from interference of the X-ray beams reflected on the film surface and on the interface to the substrate or the next film below. Even though the intensities between the measurement and the fitted curves do not fit very well, the thickness of the layer can still be calculated very precisely as long the maxima and minima of the oscillations (Kiessig fringes) in the measurement and the fit are at the same 2 Theta angles.

Table S1. XRR experimental fitting parameters of LFO, LSF-0.33, and LSF-0.8 before (pristine) and after 30 CV cycles.

	LFO		LSF-0.33		LSF-0.8	
	Pristine	After 30 CV	Pristine	After 30 CV	Pristine	After 30 CV
Crystalline Layer Thickness (nm)	37.5 ± 0.5	36.9 ± 0.3	38.6 ± 0.2	35.6 ± 0.4		38.9 ± 0.3
Amorphized Layer Thickness (nm)		1.5 ± 0.4		2.0 ± 0.3	39.2 ± 0.2	1.9 ± 0.4
XRR layer models	One layer	Two layers	One layer	Two layers	One layer	Two layers
Roughness XRR (nm)	0.61	0.69	0.67	0.82	1.73	0.41
Roughness AFM (nm)	0.5	0.51	0.30	1.12	5.36	0.54

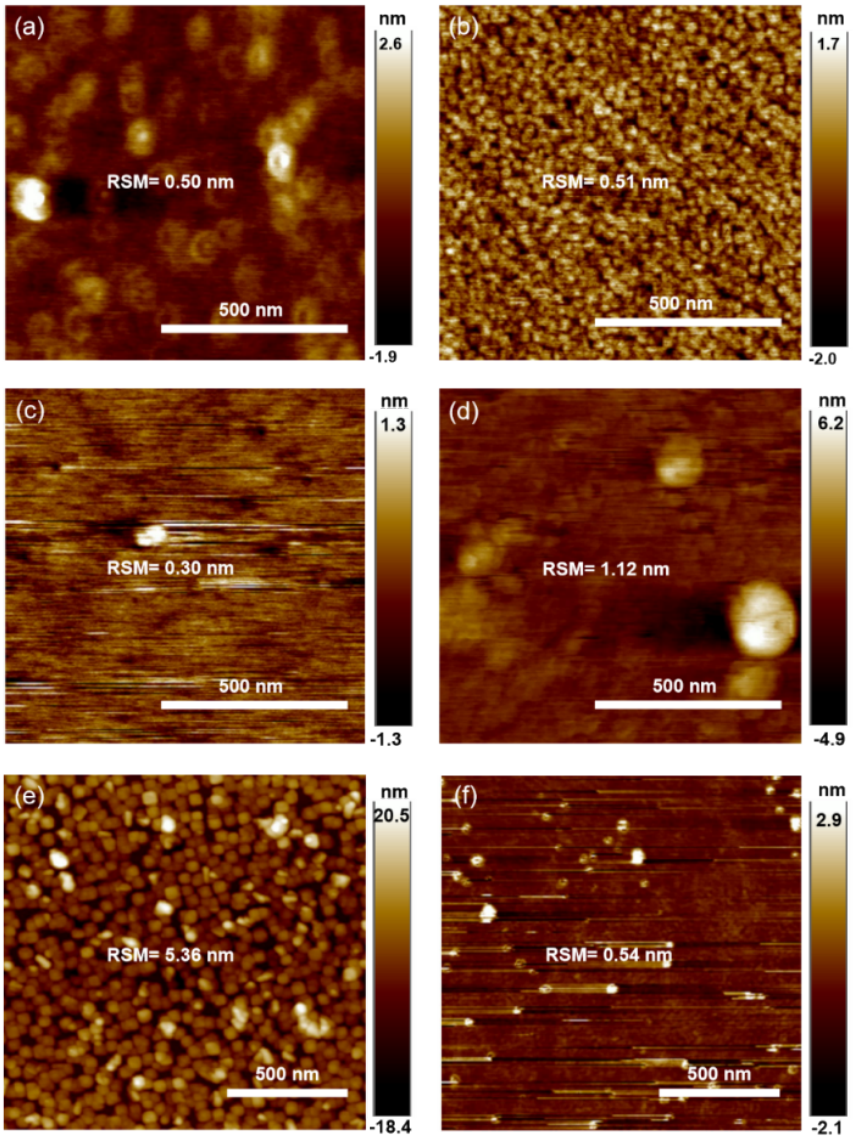

Figure S2. AFM images of $La_{1-x}Sr_xFeO_3$ thin films in pristine state and after 30 CV cycles. (a) Pristine $LaFeO_3$, (b) $LaFeO_3$ after 30 CV, (c) pristine $La_{0.33}Sr_{0.67}FeO_3$, (d) $La_{0.33}Sr_{0.67}FeO_3$ after 30 CV, (e) pristine $La_{0.2}Sr_{0.8}FeO_3$ and (f) $La_{0.2}Sr_{0.8}FeO_3$ after 30 CV.

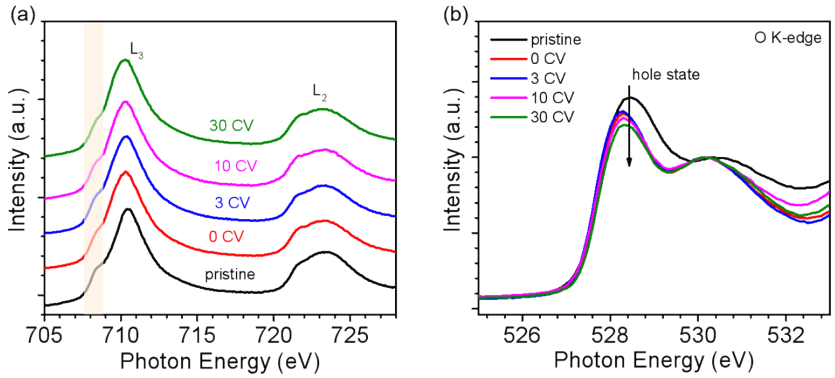

Figure S3. NEXAFS spectra of $La_{0.2}Sr_{0.8}FeO_3$ with different CV cycles. (a) Fe $L_{2,3}$-edge and (b) O K-edge. The yellow bars in Figure S3a indicate the changes in the characteristics energy range of Fe^{3+} and Fe^{4+} at 708 eV under different CV cycles.

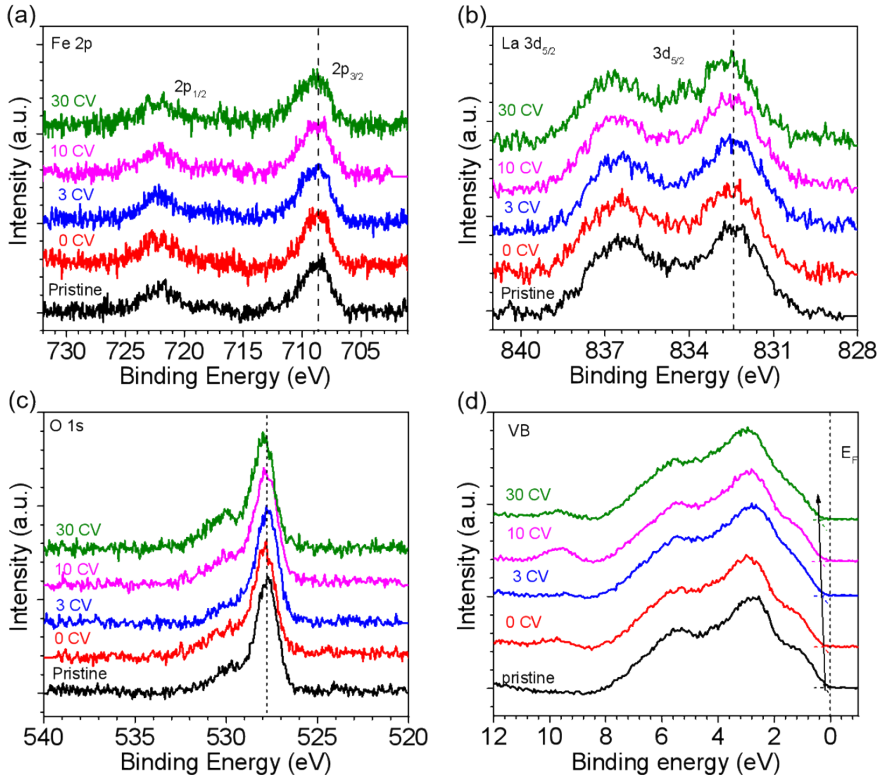

Figure S4. SXPS of $La_{0.67}Sr_{0.33}FeO_3$ with kinetic energy constant at 550 eV. (a) Fe 2p, (b) La 3d, (c) O 1s and (d) VB spectra with different CV cycles.

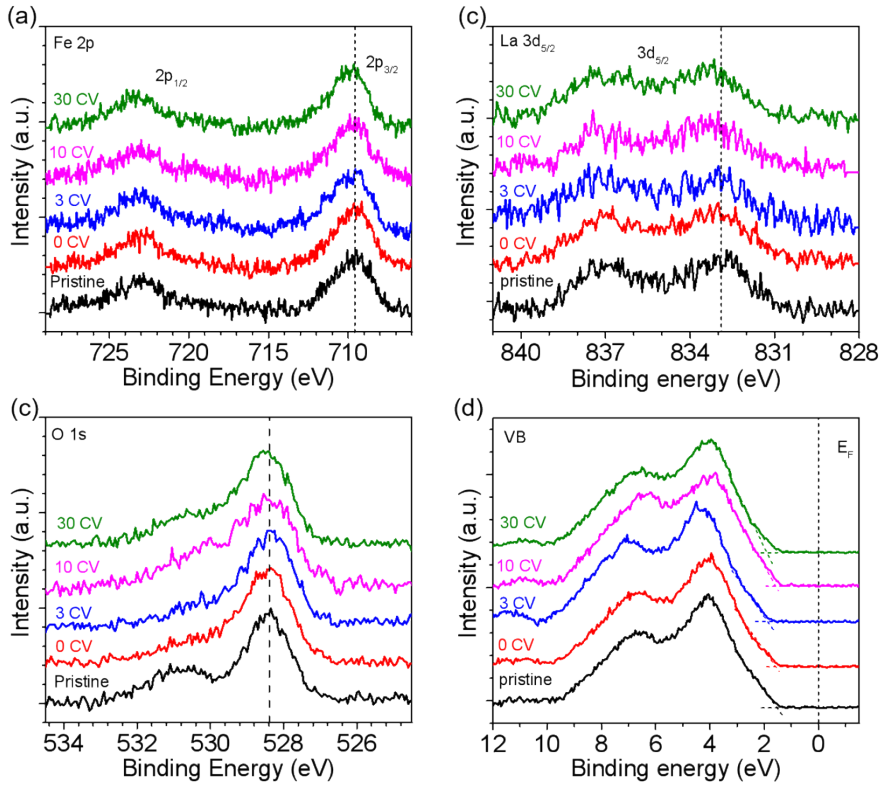

Figure S5. SXPS of $La_{0.2}Sr_{0.8}FeO_3$ with kinetic energy constant at 550 eV. (a) Fe 2p, (b) La 3d, (c) O 1s and (d) VB spectra with different CV cycles.