

## Supporting Information

# Evolution of Exsolved Nanoparticles on a Perovskite Oxide Surface during a Redox Process

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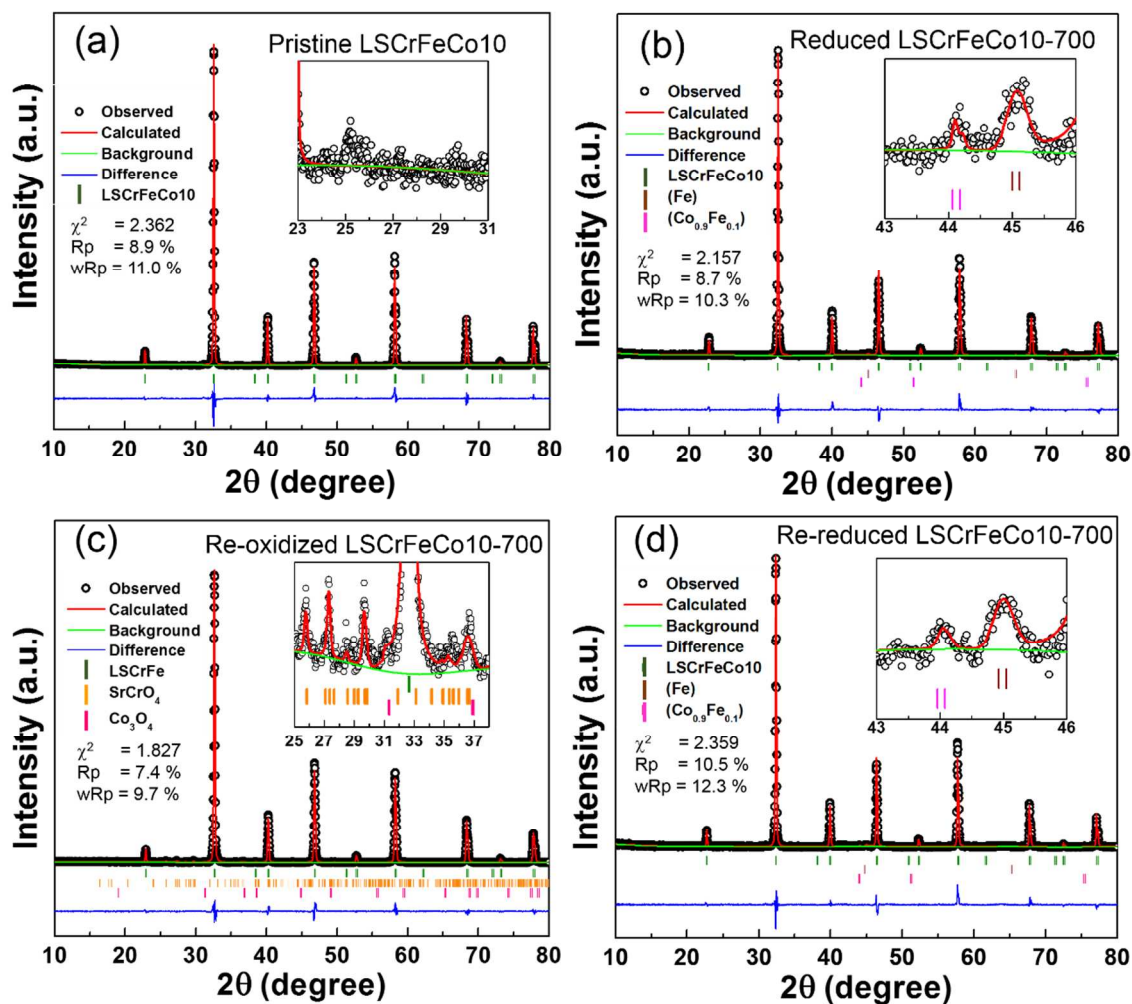


Figure S1. XRD refinement results of (a) pristine LSCrFeCo10, (b) reduced LSCrFeCo10, (c) re-oxidized LSCrFeCo10, and (d) re-reduced LSCrFeCo10 samples where the redox temperature is 700 °C. The inset shows the selective  $2\theta$  range of major peaks for the impurity phase.

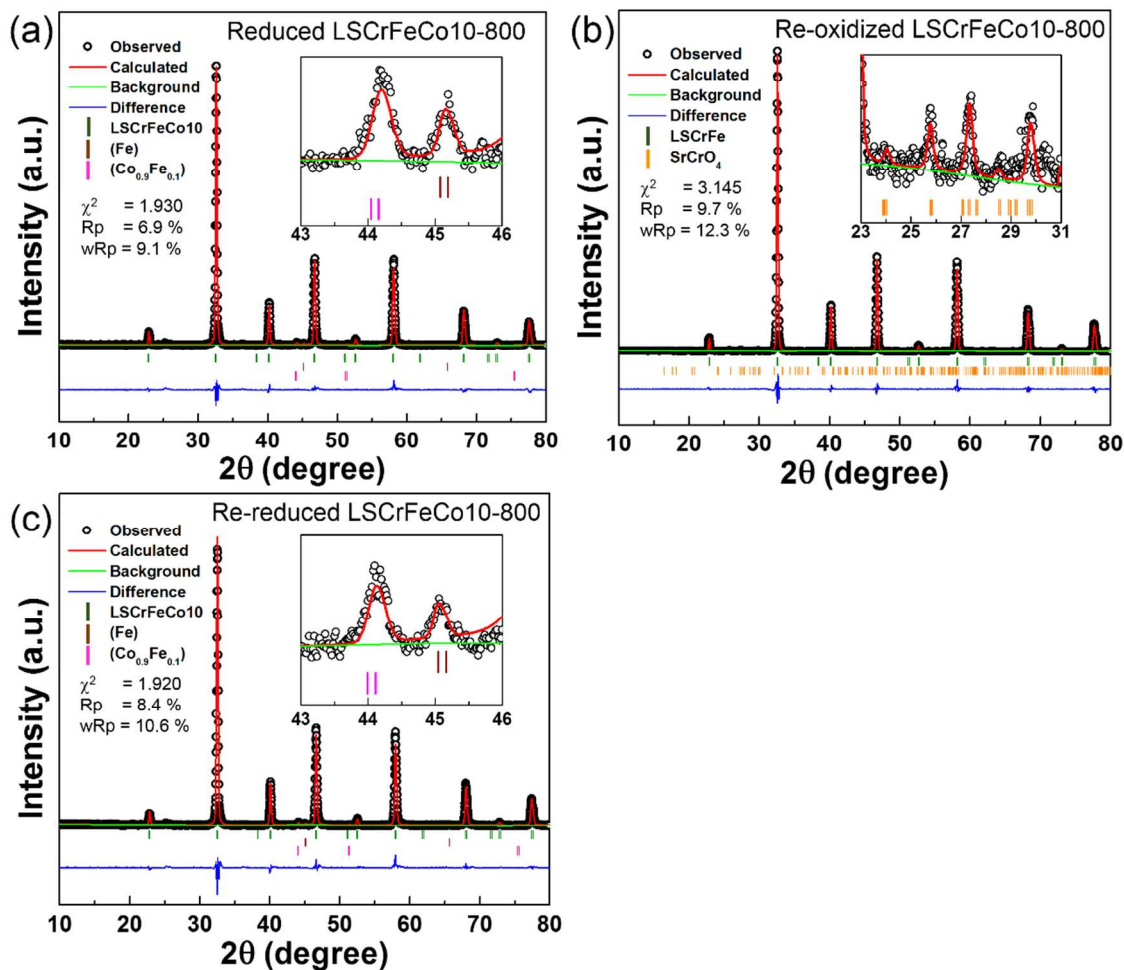


Figure S2. XRD refinement results of (a) reduced LSCrFeCo10, (b) re-oxidized LSCrFeCo10, and (c) re-reduced LSCrFeCo10 samples where the redox temperature is 800 °C. The inset shows the selective  $2\theta$  range of major peaks for the impurity phase.

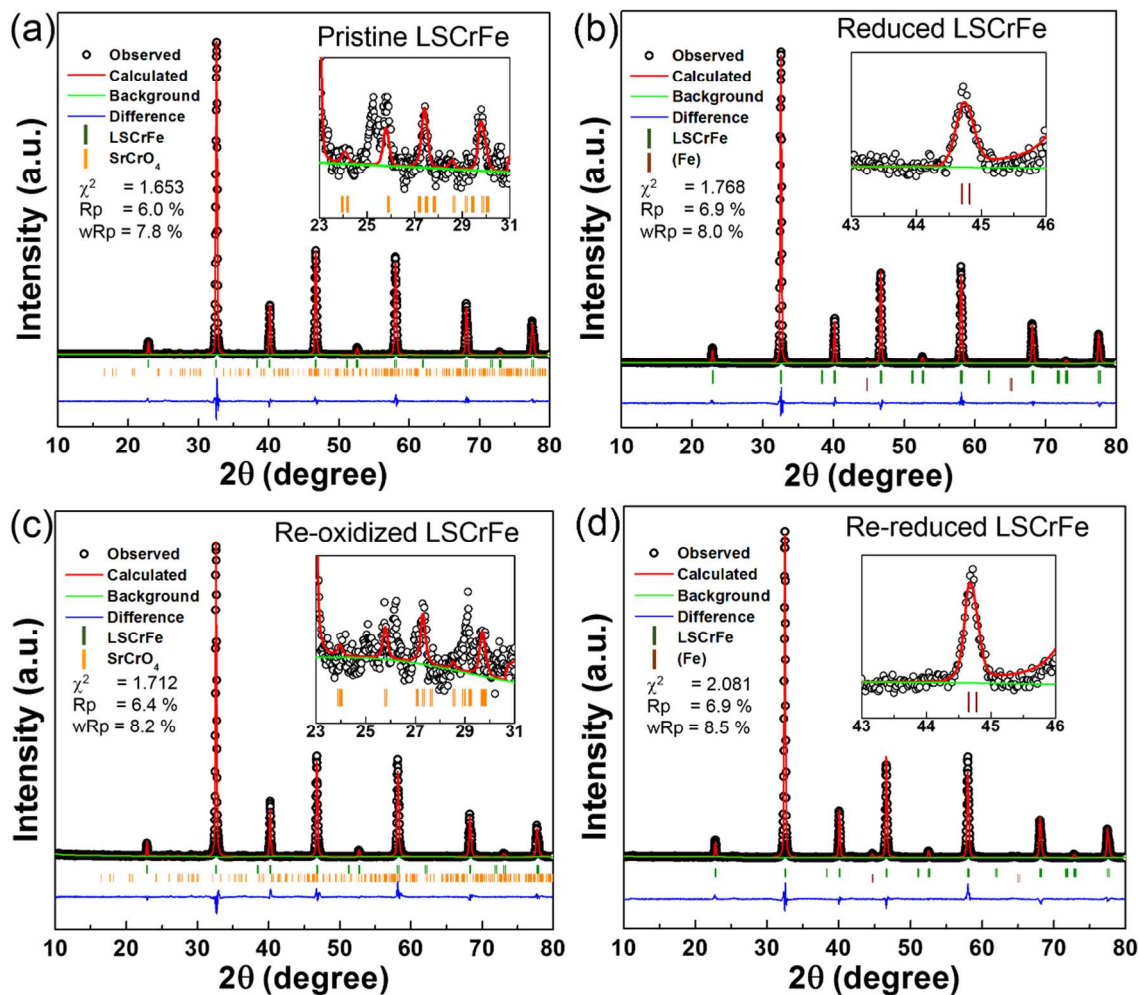
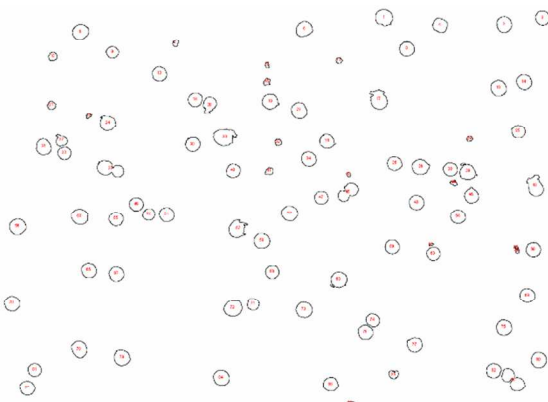
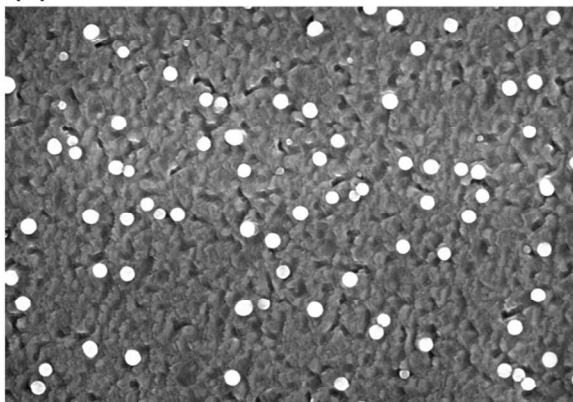


Figure S3. XRD refinement results of (a) pristine LSCrFe, (b) reduced LSCrFe, (c) re-oxidized LSCrFe, and (d) re-reduced LSCrFe samples where the redox temperature is 800 °C. The inset shows the selective  $2\theta$  range of major peaks for the impurity phase.

Table S1: Lattice parameters and fraction of LSCrFe and impurity phase during the redox process at 800 °C

Process	Phase	Lattice Parameters			Fraction (wt.%)
		a (Å)	b (Å)	c (Å)	
<b><u>LSCrFe powder annealed at 800 °C for 24 h</u></b>					
Pristine	Perovskite	5.5056(5)		13.4845(2)	98.2
	SrCrO <sub>4</sub>	7.0091(6)	7.3061(6)	6.6782(5)	1.8
Reduced	Perovskite	5.5043(2)		13.4832(1)	99.4
	(Fe)	2.8644(6)			0.6
Re-oxidized	Perovskite	5.4951(1)		13.4607(5)	98.1
	SrCrO <sub>4</sub>	7.0635(1)	7.3657(9)	6.7192(8)	1.9
Re-reduced	Perovskite	5.5041(1)		13.4821(6)	98.9
	(Fe)	2.8571(3)			1.1

**(a) Reduced at 800 °C**



**(b) Re-reduced at 800 °C**

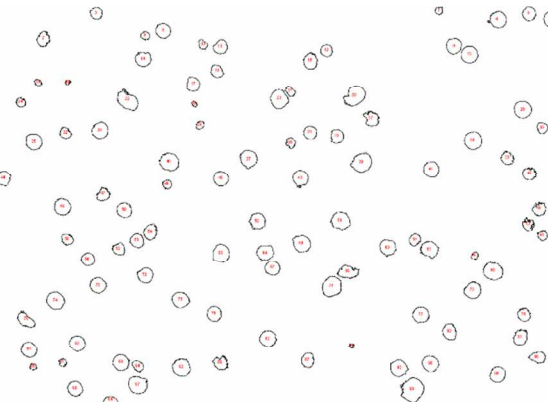
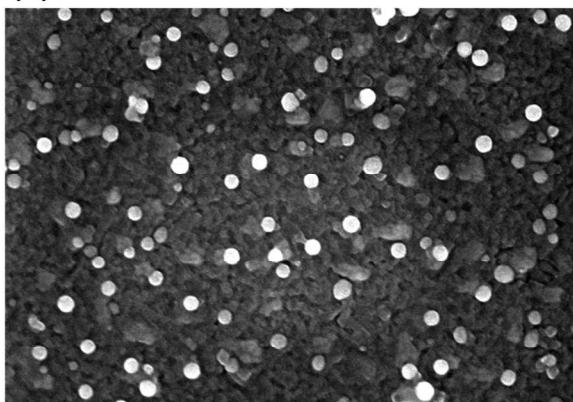
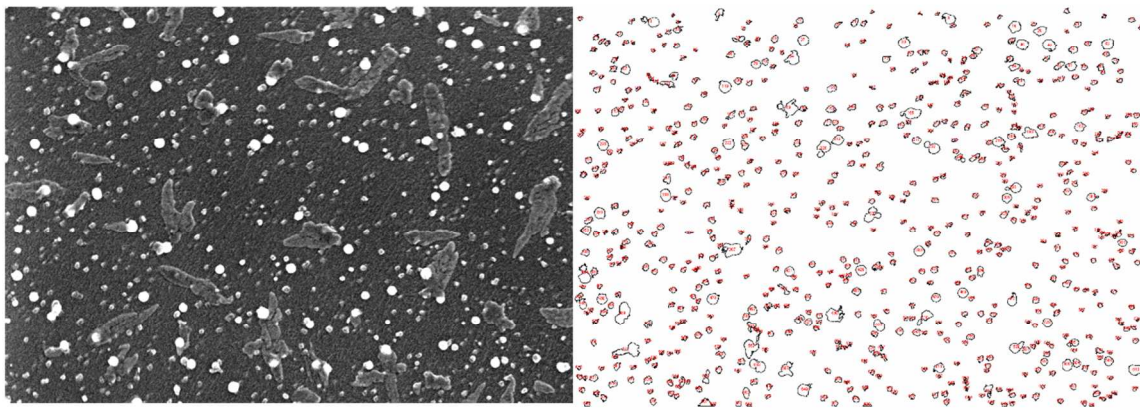


Figure S4. Particle size analysis for the LSCrFeCo10 samples which were (a) reduced and (b) re-reduced at 800 °C for 24 h. The scale bar is 1  $\mu\text{m}$ .



**(a) Reduced at 700 °C**



**(b) Re-reduced at 700 °C**

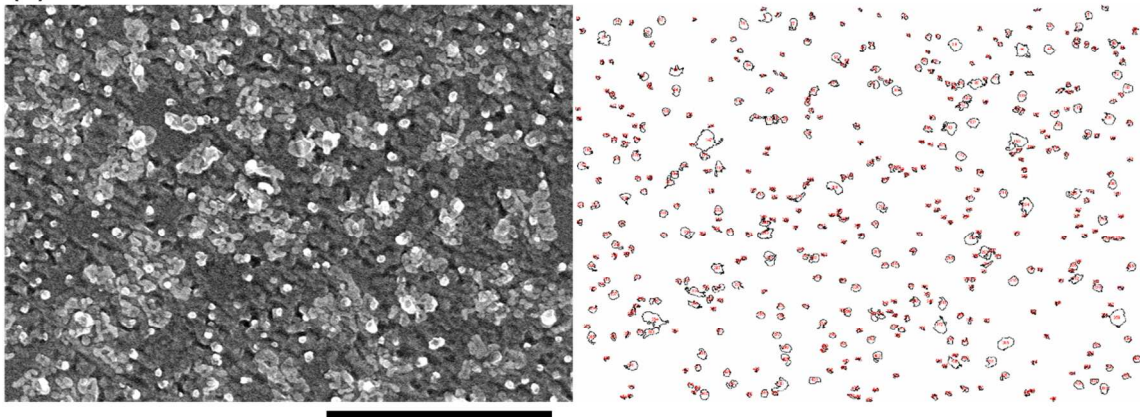


Figure S5. Particle size analysis for the LSCrFeCo10 samples which were (a) reduced and (b) re-reduced at 700 °C, respectively, for 24 h and 36 h. The scale bar is 1  $\mu\text{m}$ .