Supporting Information

Oxygen Storage Property and Chemical Stability of $SrFe_{1-x}Ti_xO_{3-\delta}$ with Robust Perovskite Structure

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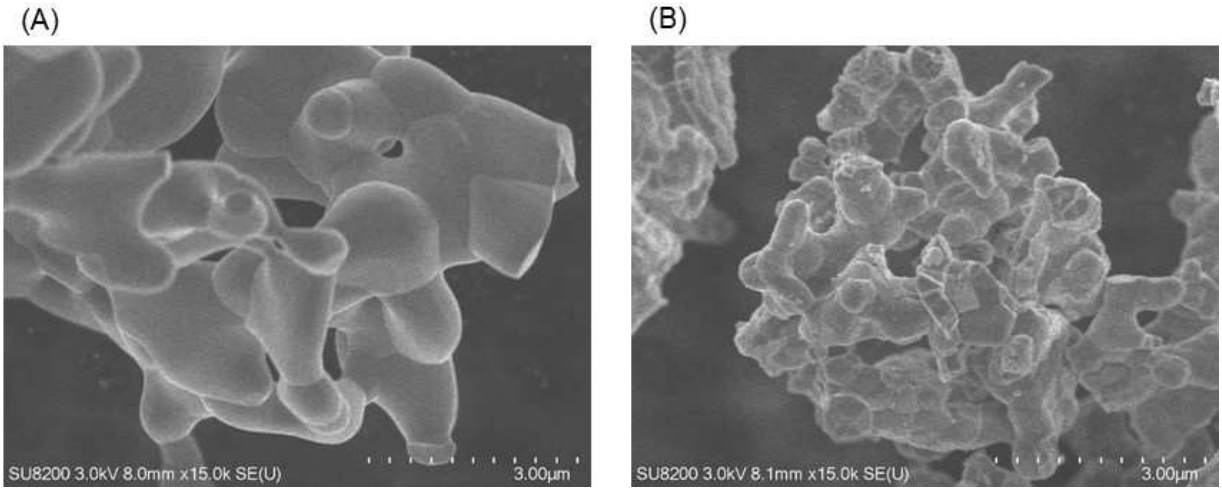

Figure S1. SEM images of $SrFeO_{3-\delta}$ (A) and $SrFe_{0.8}Ti_{0.2}O_{3-\delta}$ (B).

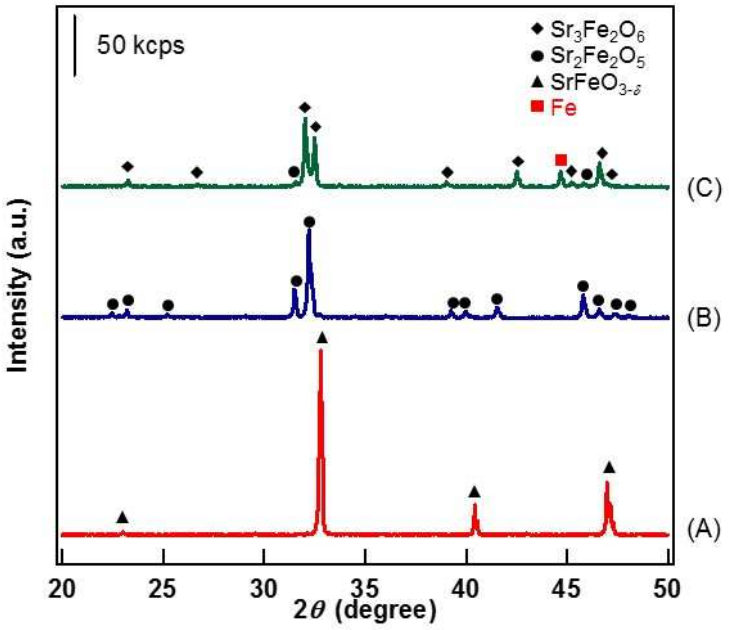

Figure S2. XRD patterns of (A) as-synthesized $SrFeO_{3-\delta}$, (B) sample reduced at 773 K, and (C) sample reduced at 1223 K.

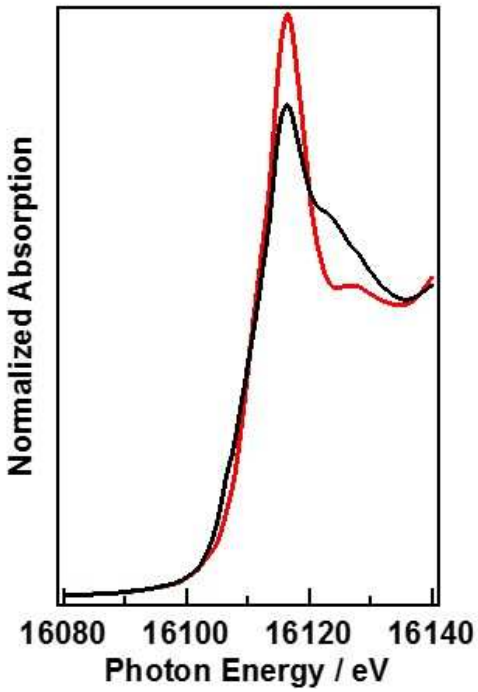

Figure S3. Sr K-edge XANES spectra of $SrFeO_{3-\delta}$ before (red) and after (black) reduction at 773 K.

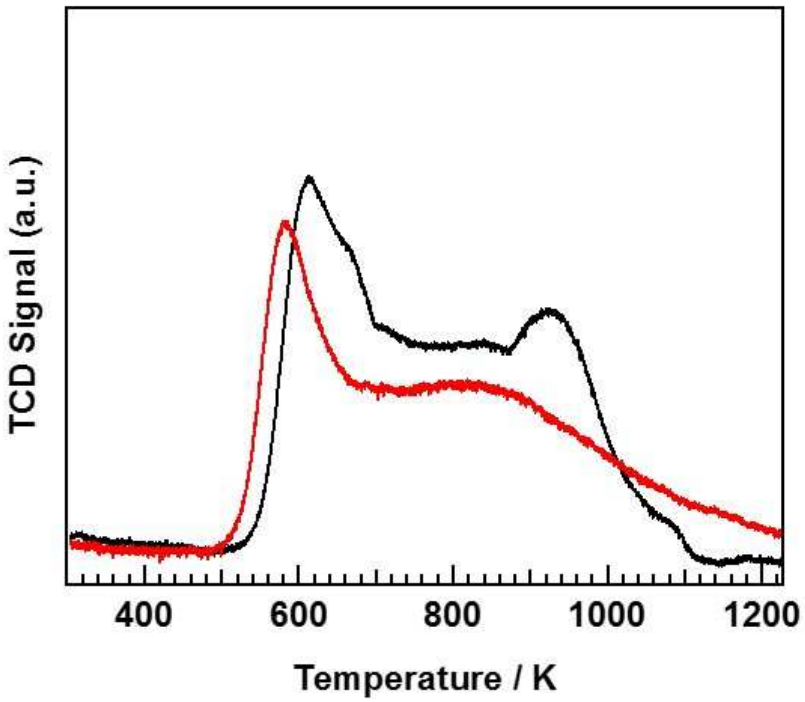

Figure S4. O_2-TPD profiles of $SrFeO_{3-\delta}$ (black) and $SrFe_{0.8}Ti_{0.2}O_{3-\delta}$ (red).

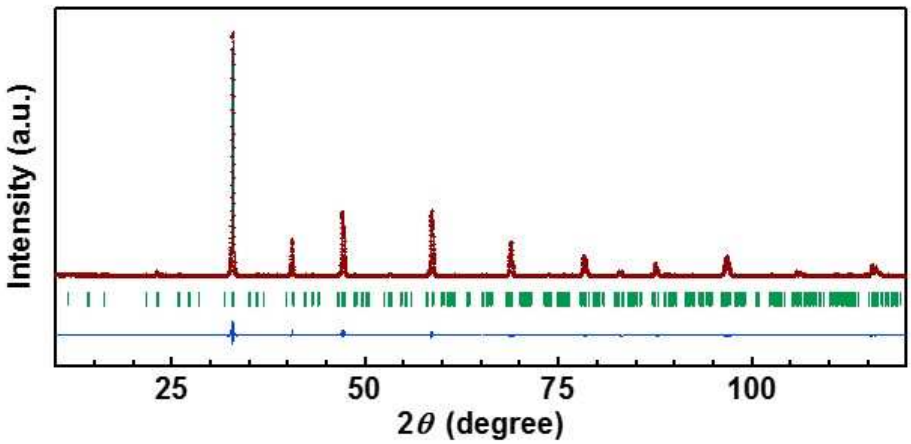

Figure S5. Result of Rietveld analysis of as-synthesized $SrFeO_{3-\delta}$: as-synthesized $SrFeO_{3-\delta}$ adopts the *I*4/*mmm* space group, a = 10.934 Å, c = 7.702 Å, Sr1 on 8*i* (0.259, 0, 0), Sr2 on 8*j* (0.251, 0, 0), Fe1 on 4*e* (0, 0, 0.254), Fe2 on 8*f* (0.25, 0.25, 0.25) ,Fe3 on 4*d* (0.5, 0, 0.25), O1 on 2*b* (0, 0, 0.5), O2 on 16*m* (0.120, 0.120, 0.223), O3 on 8*h* (0.240, 0.240, 0.5) ,O4 on 16*k* (0.124, 0.624, 0.25) and O5 on 4*c* (0.5, 0, 0) with 100% occupancy(Sr1, Sr2, Fe1, Fe2, Fe3, O1, O2,O3, O4) and 74% occupancy (O5), R_{wp} = 10.1 %, S = 1.1. The density is 5.436 g cm^{-1}.

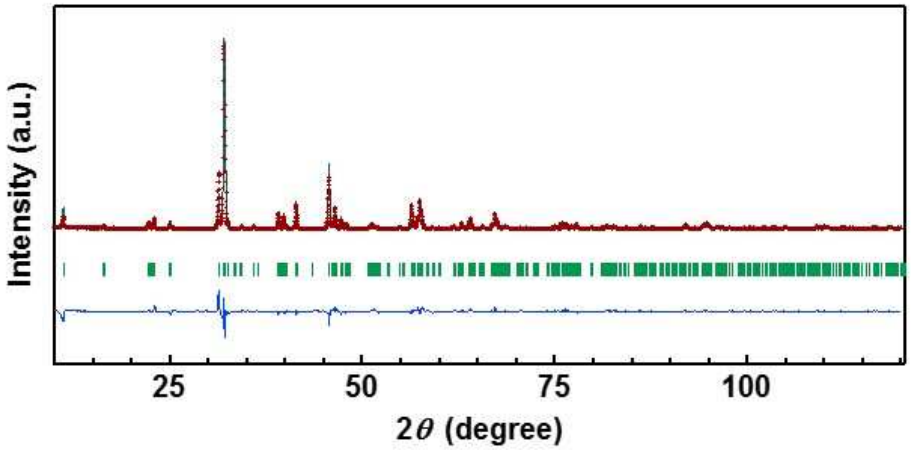

Figure S6. Result of Rietveld analysis of $SrFeO_{3-\delta}$ reduced at 773 K: $SrFeO_{3-\delta}$ reduced at 773 K adopts the *Ima*2 space group, a = 15.572 Å, b = 5.672 Å, c = 5.527 Å, Sr1 on 8*c* (0.110, 0.016, -0.493), Fe1 on 4*a* (0, 0, 0), Fe2 on 4*b* (0.25, 0.933, -0.970) , O1 on 8*c* (0.994, 0.246, -0.247), O2 on 8*c* (0.147, 0.489, 0), O3 on 4*b* (0.25, 0.845, -0.592) with 100% occupancy(Sr1, Sr2, Fe1, Fe2, O1, O2,O3), R_{wp} = 10.1 %, S = 1.2. The density is 4.993 g cm^{-1}.

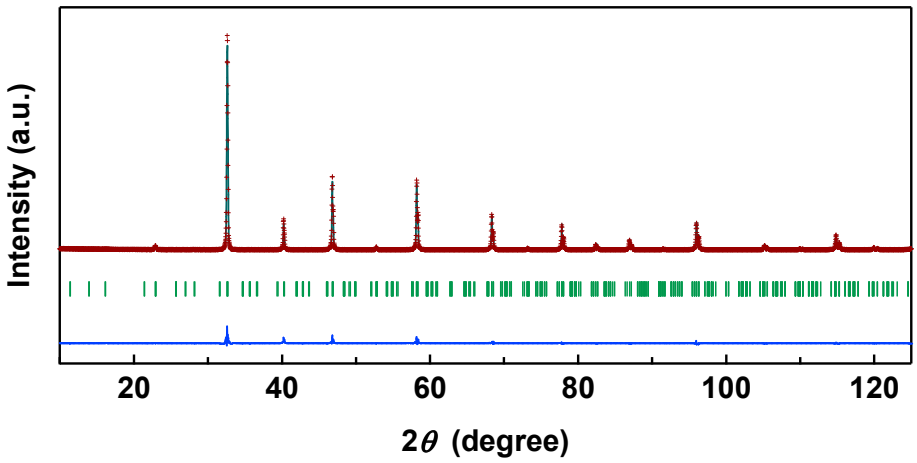

Figure S7. Result of Rietveld analysis of as-synthesized $SrFe_{0.8}Ti_{0.2}O_{3-\delta}$: as-synthesized $SrFe_{0.8}Ti_{0.2}O_{3-\delta}$ adopts the *I*4/*mmm* space group, a = 10.969 Å, c = 7.756 Å, Sr1 on 8*i* (0.249, 0, 0), Sr2 on 8*j* (0.250, 0, 0), Fe1 on 4*e* (0, 0, 0.252), Fe2 on 8*f* (0.25, 0.25, 0.25) ,Fe3 on 4*d* (0.5, 0, 0.25), Ti1 on 4*e* (0, 0, 0.252), Ti2 on 8*f* (0.25, 0.25, 0.25) ,Ti3 on 4*d* (0.5, 0, 0.25), O1 on 2*b* (0, 0, 0.5), O2 on 16*m* (0.120, 0.120, 0.223), O3 on 8*h* (0.240, 0.240, 0.5) ,O4 on 16*k* (0.124, 0.624, 0.25) and O5 on 4*c* (0.5, 0, 0) with 100% occupancy(Sr1, Sr2, O2,O3, O4), 80% occupancy(Fe1, Fe2, Fe3), 20% occupancy(Ti1, Ti2, Ti3), 66% occupancy (O1) and 91% occupancy (O5) , R_{wp} = 10.7 %, S = 1.0. The density is 5.319 g cm^{-1}.

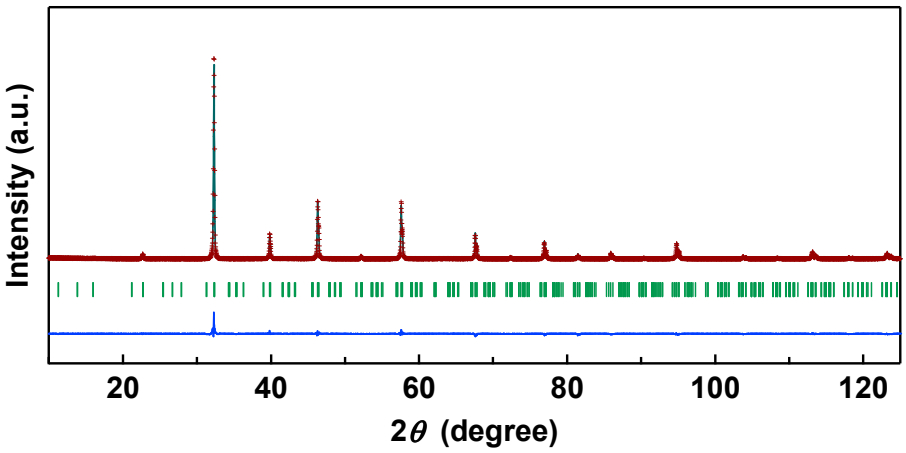

Figure S8. Result of Rietveld analysis $SrFe_{0.8}Ti_{0.2}O_{3-\delta}$ of after reduction at 773 K: $SrFe_{0.8}Ti_{0.2}O_{3-\delta}$ reduced at 773 K adopts the *I*4/*mmm* space group, a = 11.074 Å, c = 7.833 Å, Sr1 on 8*i* (0.254, 0, 0), Sr2 on 8*j* (0.252, 0, 0), Fe1 on 4*e* (0, 0, 0.253), Fe2 on 8*f* (0.25, 0.25, 0.25) ,Fe3 on 4*d* (0.5, 0, 0.25), Ti1 on 4*e* (0, 0, 0.253), Ti2 on 8*f* (0.25, 0.25, 0.25) ,Ti3 on 4*d* (0.5, 0, 0.25), O1 on 2*b* (0, 0, 0.5), O2 on 16*m* (0.120, 0.120, 0.223), O3 on 8*h* (0.240, 0.240, 0.5) ,O4 on 16*k* (0.124, 0.624, 0.25) and O5 on 4*c* (0.5, 0, 0) with 100% occupancy(Sr1, Sr2, O2, O4), 80% occupancy(Fe1, Fe2, Fe3), 20% occupancy(Ti1, Ti2, Ti3), 51% occupancy (O1), 82% occupancy (O3) and 58% occupancy (O5) , R_{wp} = 11.0 %, S = 1.1. The density is 5.083 g cm^{-1}.