

Electronic Supplementary Information

Crystal structure and fluoride-ion conductivity of strontium cerium fluoride epitaxial films prepared by topochemical fluorination

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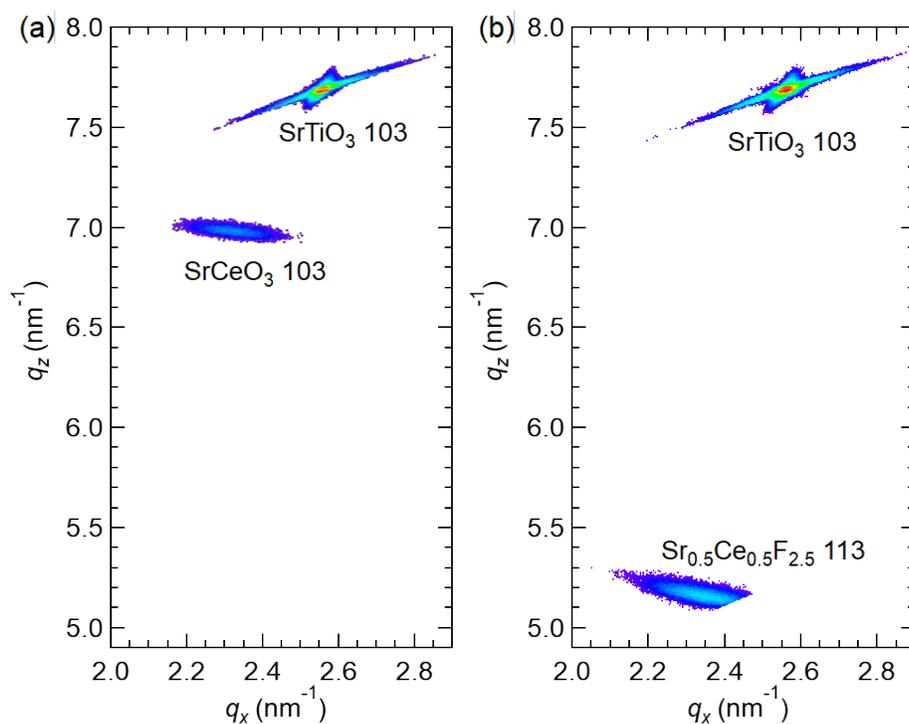


Figure S1. Reciprocal space mapping images around (a) the 103 asymmetric diffraction of the SrCeO₃ precursor film and (b) the 113 asymmetric diffraction of the film fluorinated at $T_f = 500$ °C (Sr_{0.5}Ce_{0.5}F_{2.5}).

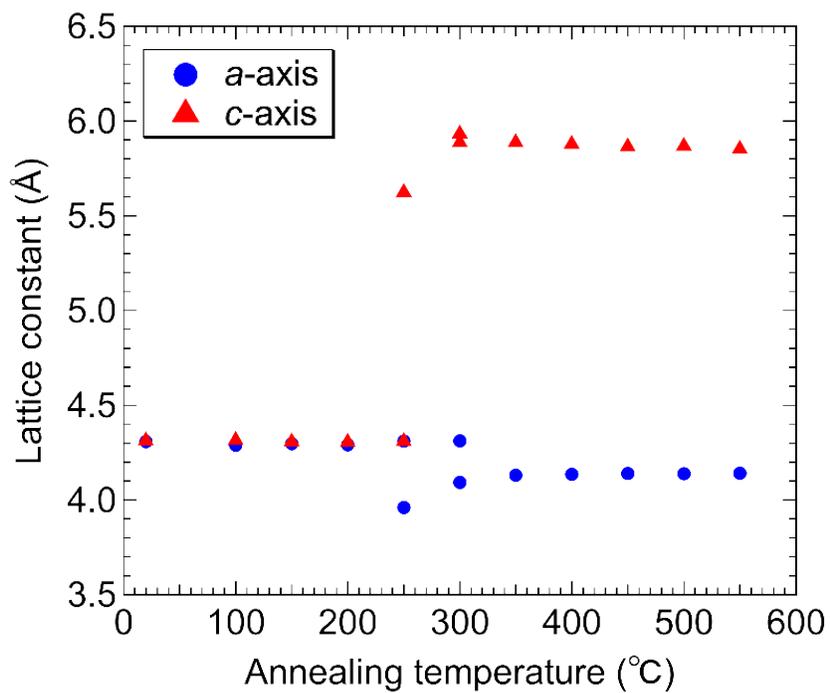


Figure S2. Variations of the lengths of the a - and c -axes of the SrCeO_3 precursor and fluorinated films as a function of T_f . Note that the a -axis lengths were determined by detecting the 101 diffraction peaks of the films.

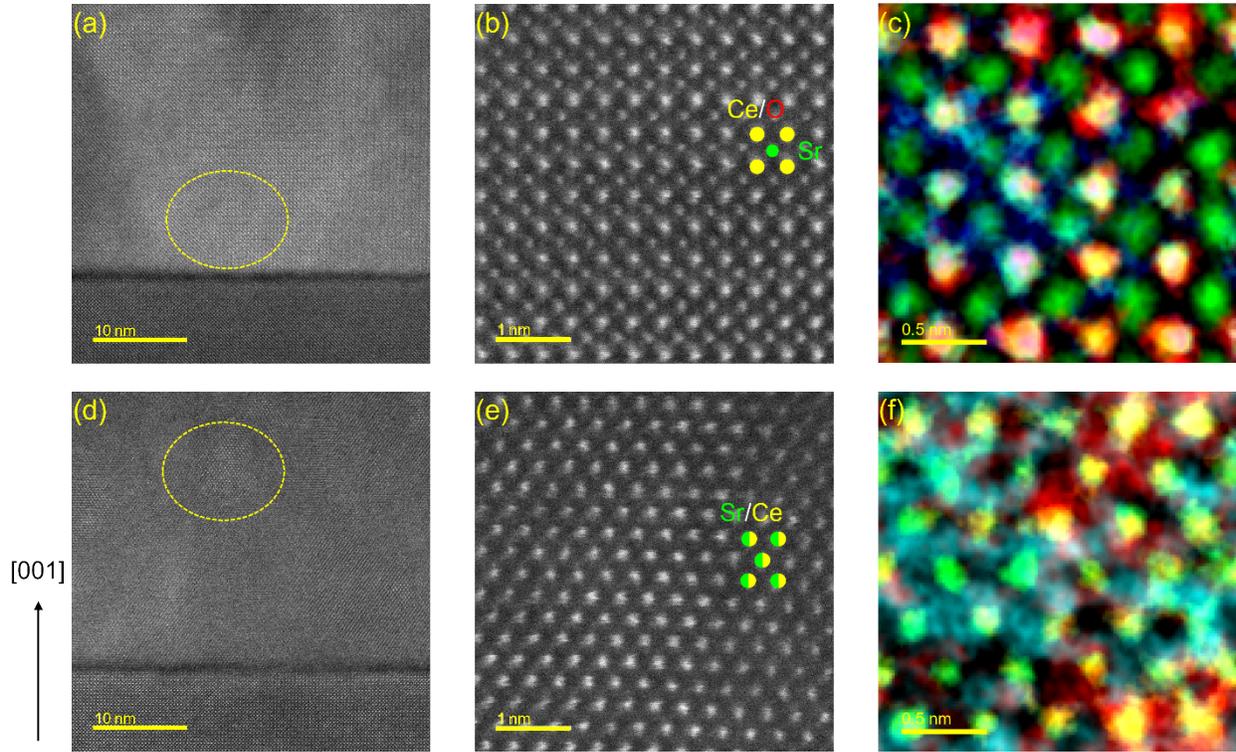


Figure S3. (a, d) Wide-range cross-sectional annular dark-field scanning transmission electron microscopy (STEM) images, (b, e) enlarged images of the circled areas in (a) and (d), which correspond to the perovskite and fluorite structures, respectively, (c, f) STEM–energy dispersive spectroscopy maps of (b) and (e) colored using wavelet-transform-inspired image processing (Sr: green, Ce: yellow, O: red, and F: blue) of the SrCeO₃ film obtained at $T_f = 250$ °C and a temperature rise time of 1 h.

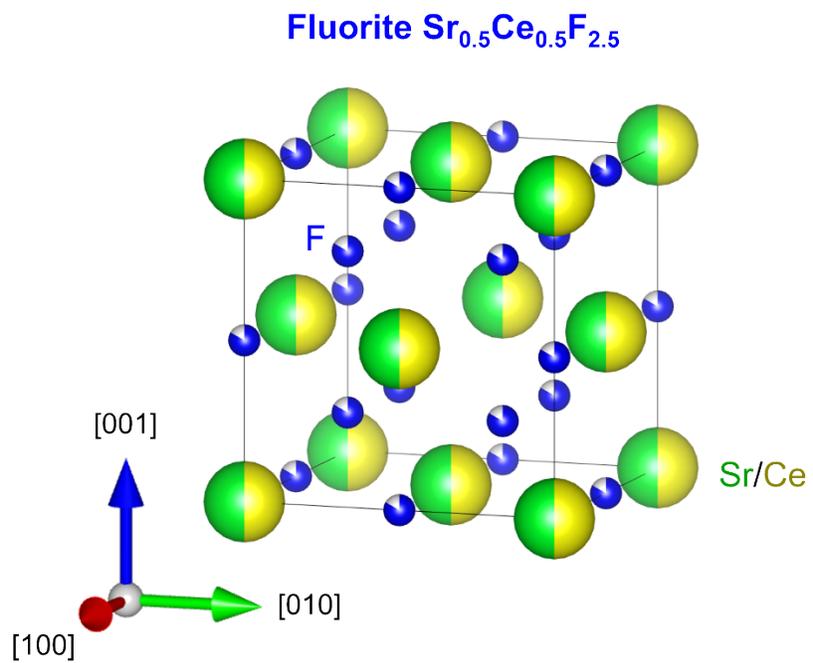


Figure S4. Schematic of the fluorite crystal structure of $\text{Sr}_{0.5}\text{Ce}_{0.5}\text{F}_{2.5}$.

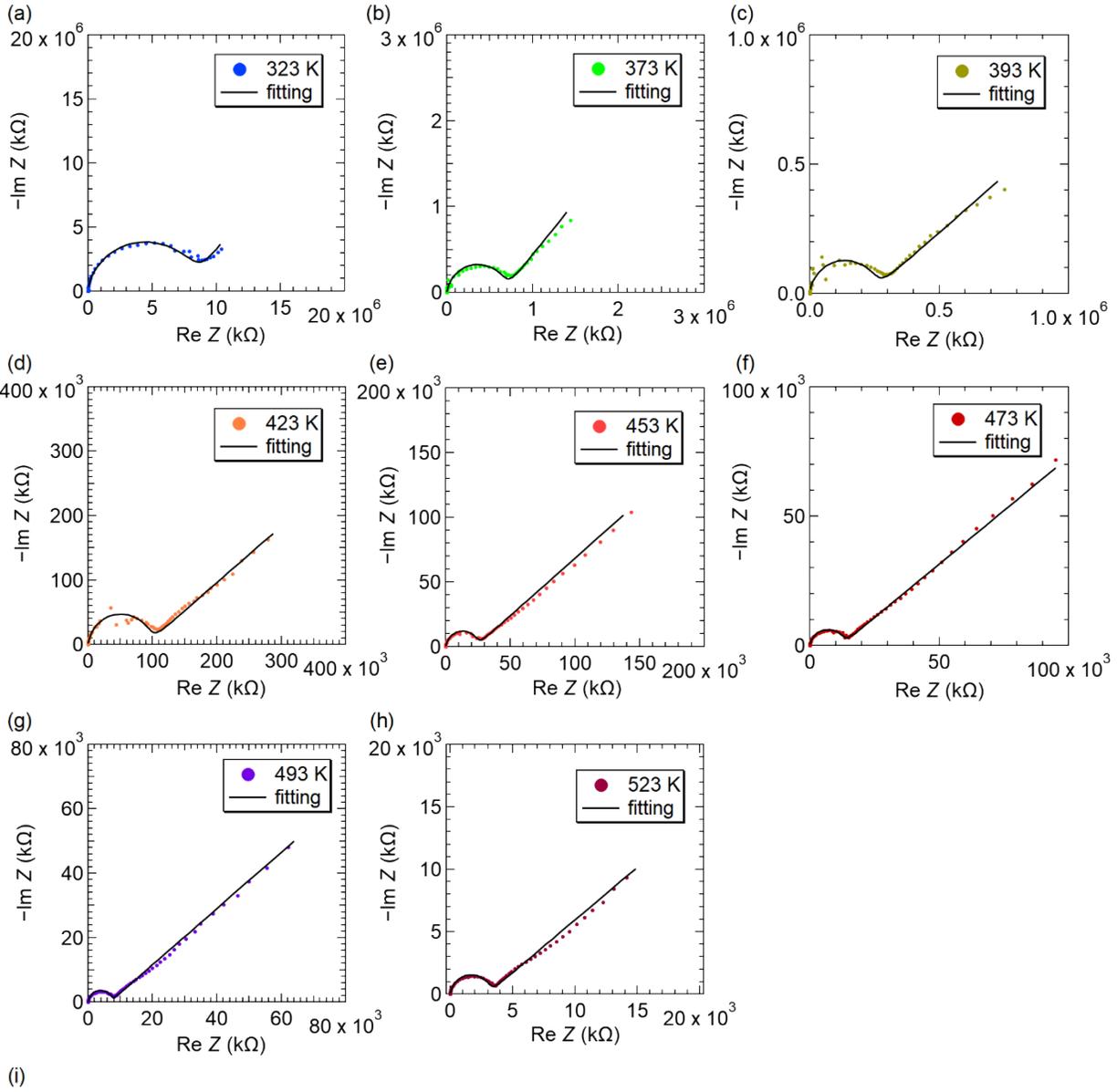


Figure S5. In-plane impedance spectra and the fitting results of the $\text{Sr}_{0.5}\text{Ce}_{0.5}\text{F}_{2.5}$ film (obtained at $T_f = 500^\circ\text{C}$) obtained at (a) 323 K, (b) 373 K, (c) 393 K, (d) 423 K, (e) 453 K, (f) 473 K, (g) 493 K, and (h) 523 K. (g) Equivalent circuits for the impedance spectra.

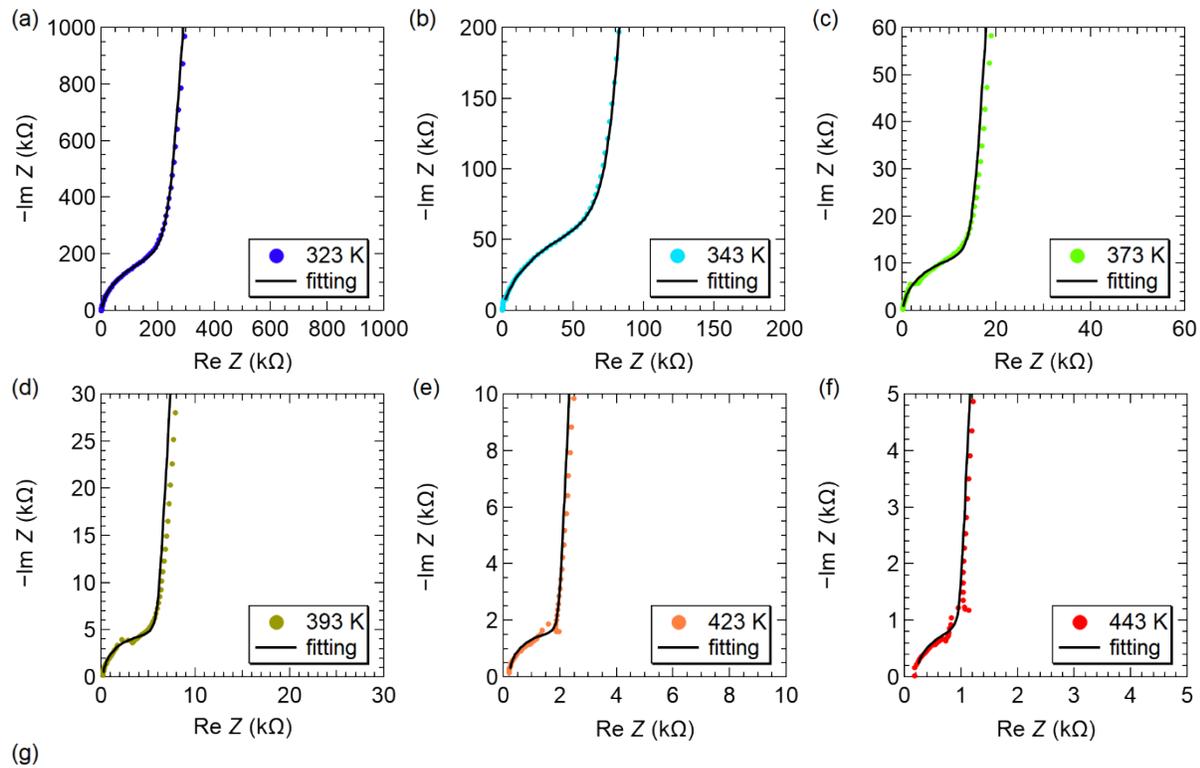


Figure S6. Out-of-plane impedance spectra and the fitting results of the $\text{Sr}_{0.5}\text{Ce}_{0.5}\text{F}_{2.5}$ film (obtained at $T_f = 500\text{ }^\circ\text{C}$) obtained at (a) 323 K, (b) 343 K, (c) 373 K, (d) 393 K, (e) 423 K, and (f) 443 K. (g) Equivalent circuits for the impedance spectra.