

## Supplementary information

### Overlayer deposition-induced control of oxide ion concentration in $\text{SrFe}_{0.5}\text{Co}_{0.5}\text{O}_{2.5}$ oxygen sponges

Joonhyuk Lee,<sup>a</sup> Younghak Kim,<sup>b</sup> Jinhyung Cho,<sup>c</sup> Hiromichi Ohta<sup>\*d</sup> and Hyoungjeen Jeen<sup>\*ae</sup>

<sup>a</sup>Department of Physics, Pusan National University, Busan 46241, Korea

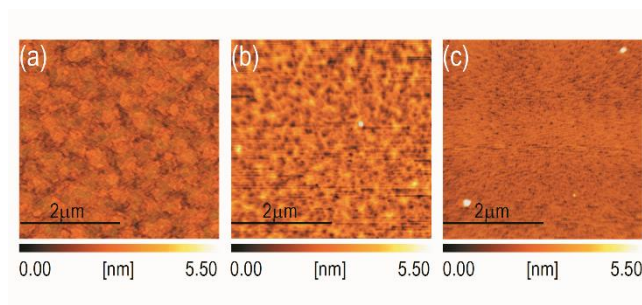
<sup>b</sup>Pohang Accelerator Laboratory, Pohang University of Science and Technology, Pohang 37673, Korea

<sup>c</sup>Department of Physics Education, Pusan National University, Busan 46241, Korea

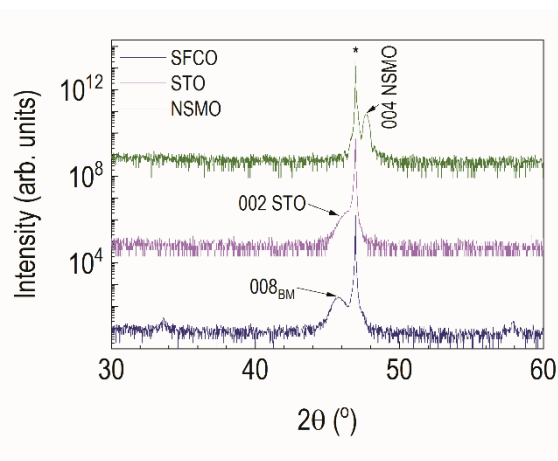
<sup>d</sup>Research Institute for Electronic Science, Hokkaido University, Sapporo 001-0020, Japan

<sup>e</sup>Research Center for Dielectric and Advanced Matter Physics, Pusan National University, Busan 46241, Korea

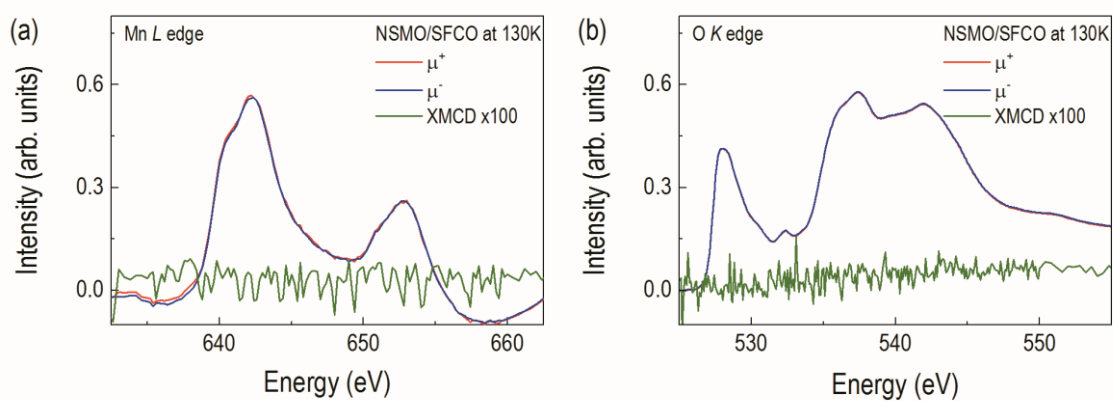
\*Email: [hiromichi.ohata@es.hokudai.ac.jp](mailto:hiromichi.ohata@es.hokudai.ac.jp), [hjeen@pusan.ac.kr](mailto:hjeen@pusan.ac.kr)



**Fig S1.** Topographic AFM images of (a) SFCO, (b) STO/SFCO, and (c) NSMO/SFCO films.



**Fig S2.** XRD patterns of SFCO (navy line), STO (magenta line) and NSMO (olive line).



**Fig S3.** (a) Mn *L* edge and (b) O *K* edge XMCD spectra of an NSMO/SFCO. The XMCD spectra of Mn *L* edge and O *K* edge are multiplied 100 times, but there is no ferromagnetic signal.