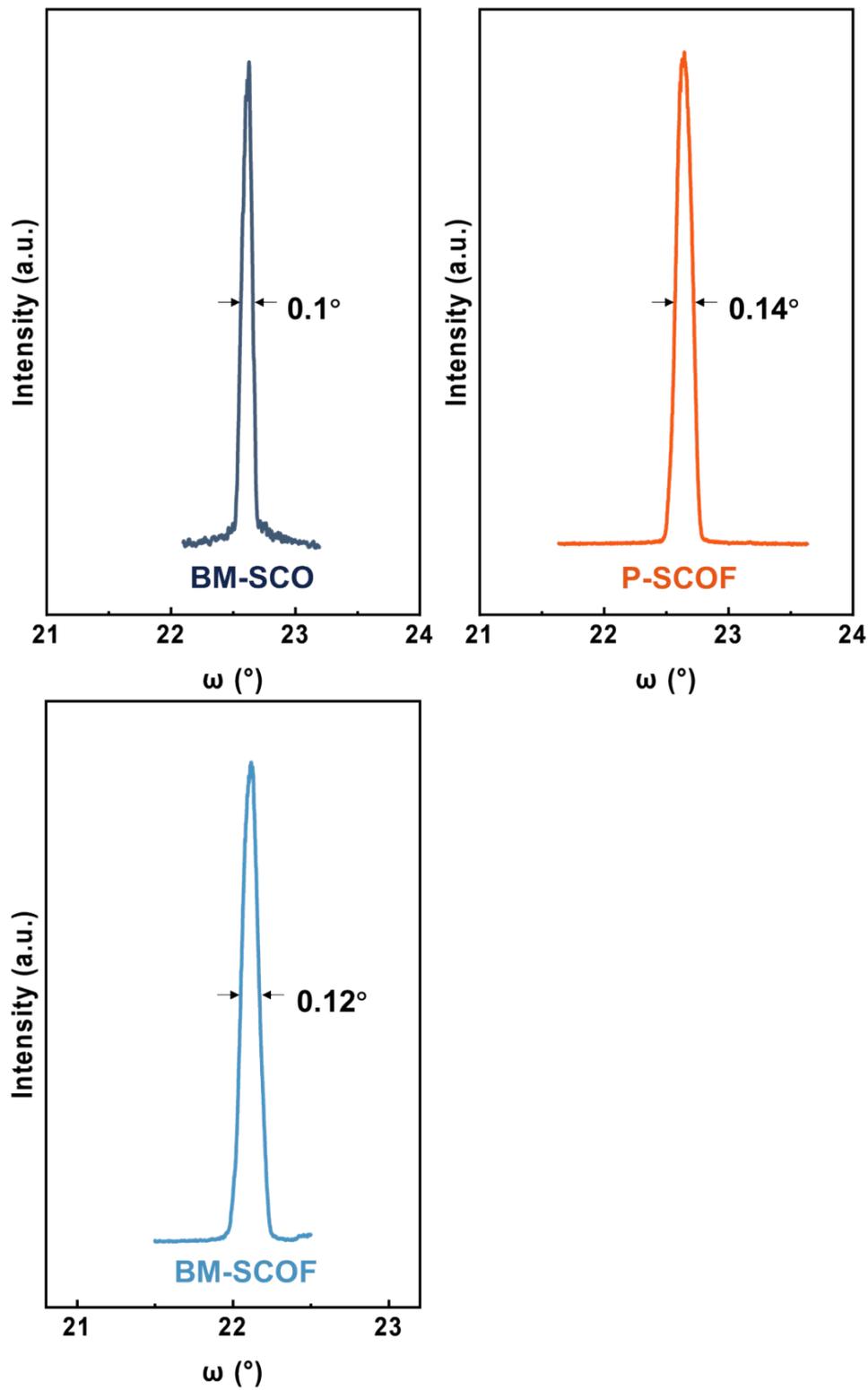
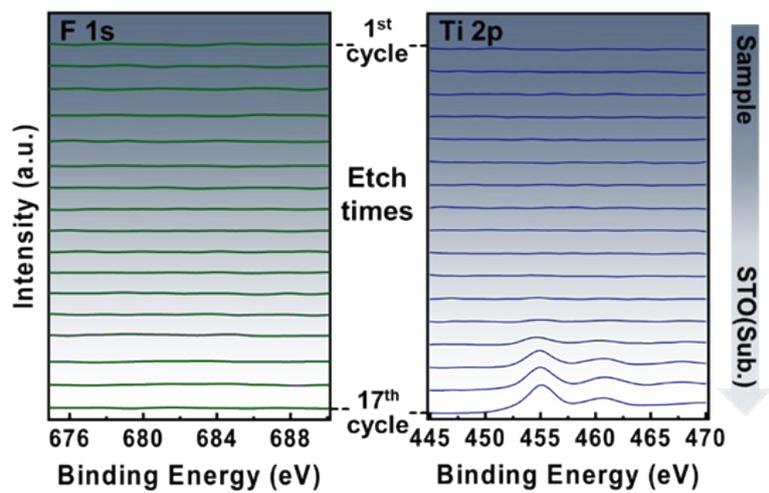


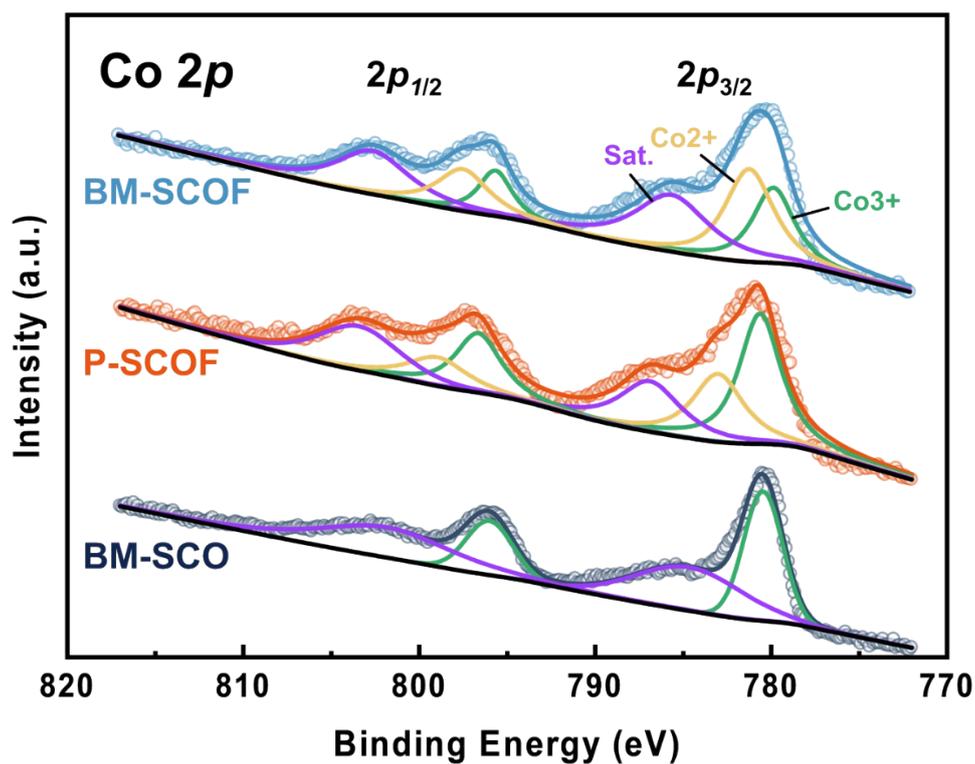
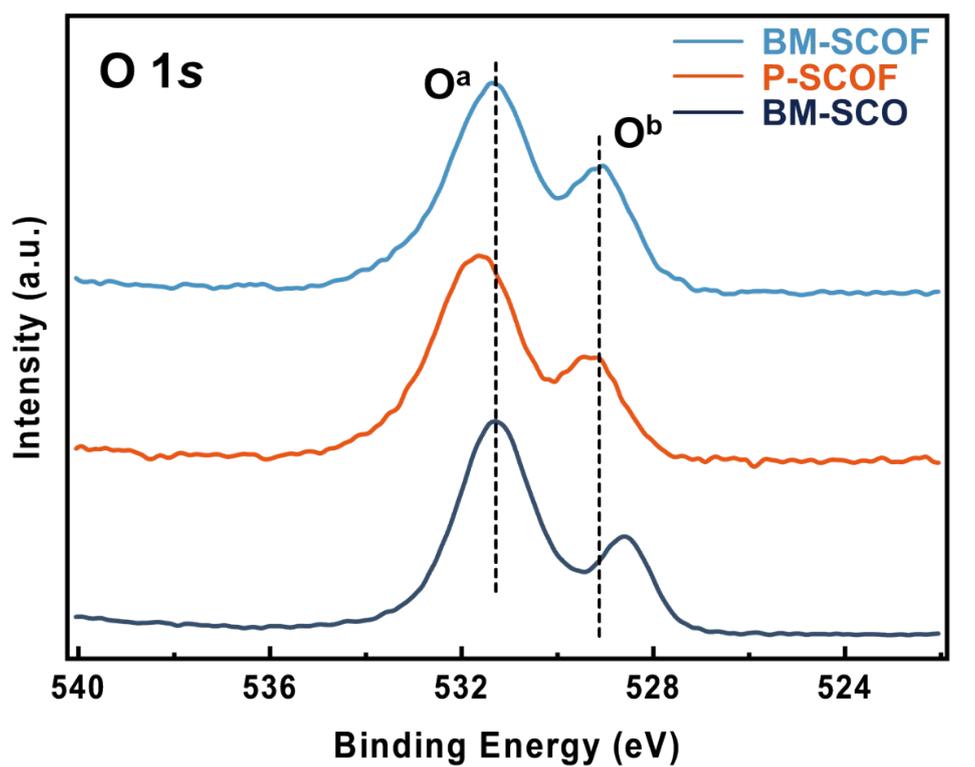
**Figure S1.** AFM surface topography of BM-SCO, P-SCOF, and BM-SCOF thin films.



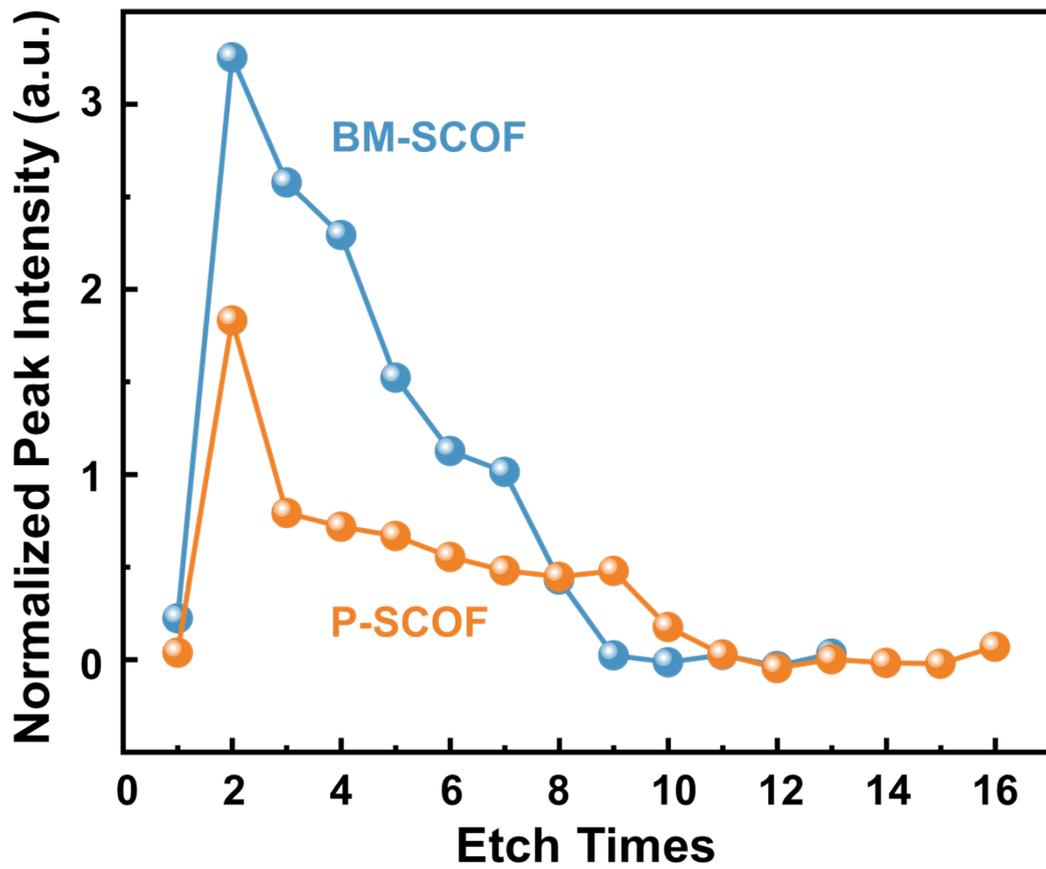
**Figure S2.** Rocking curves for BM-SCO (002), P-SCOF (002), and BM-SCOF (002) diffractions, respectively.



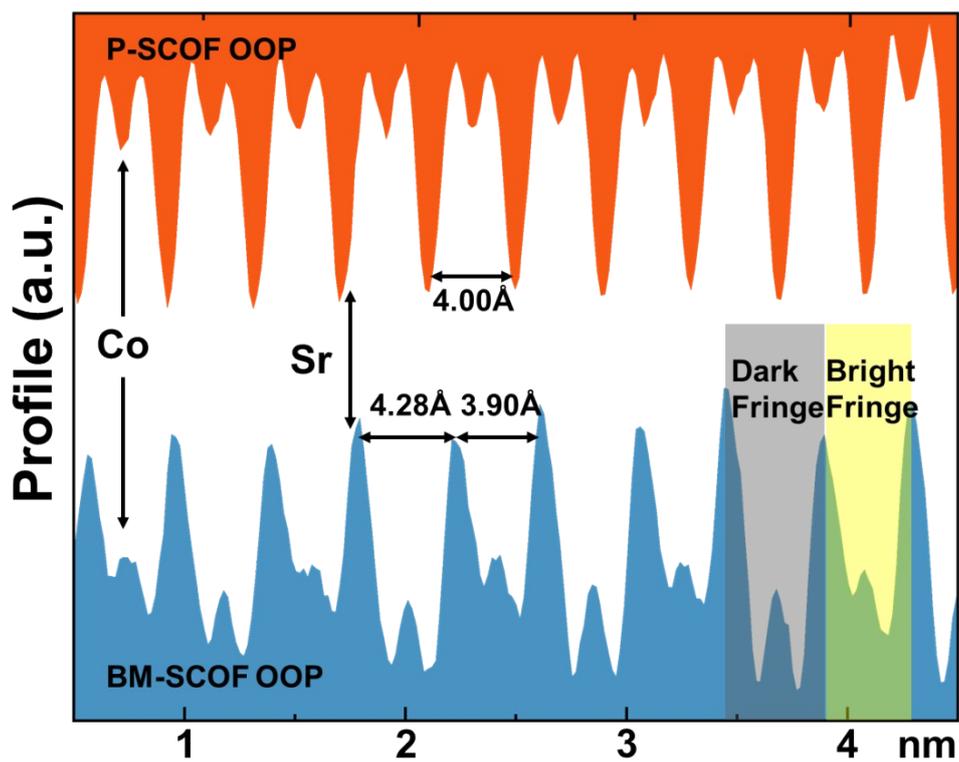
**Figure S3** XPS depth profile of F1s and Ti2p for annealed BM-SCOF.



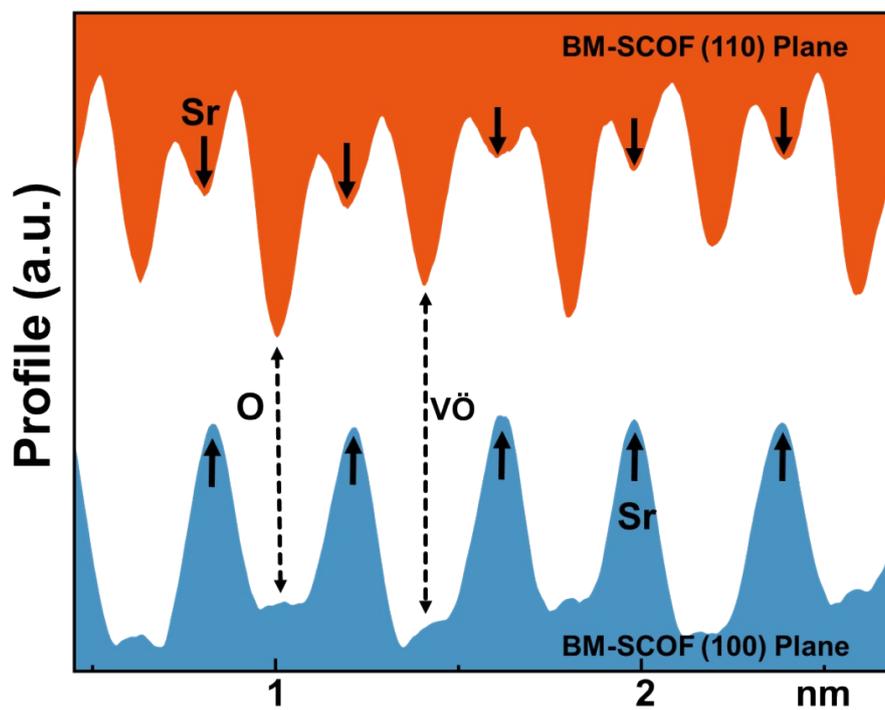
**Figure S4.** XPS of O 1s and Co 2p emissions for BM-SCO, P-SCOF, and BM-SCOF before the XPS etching, respectively.



**Figure S5.** The evolution of F 1s emission of P-SCOF and BM-SCOF upon etch times. The intensities have been normalized by referring to the Ti 2p intensity.



**Figure S6.** Line profile along the [001] direction of P-SCOF (110) plane (orange) and BM-SCOF (110) plane (blue) in Figure 3 c & e, respectively.



**Figure S7.** Line profile along the [001] direction of the BM-SCOF (100) and (110) plane in Figure 3 h & i, respectively.