Supplementary Information (SI) for Energy Advances.

Supporting information for

Development of an automated SILAR method for the sustainable fabrication of BiOI/TiO_2 photoanodes

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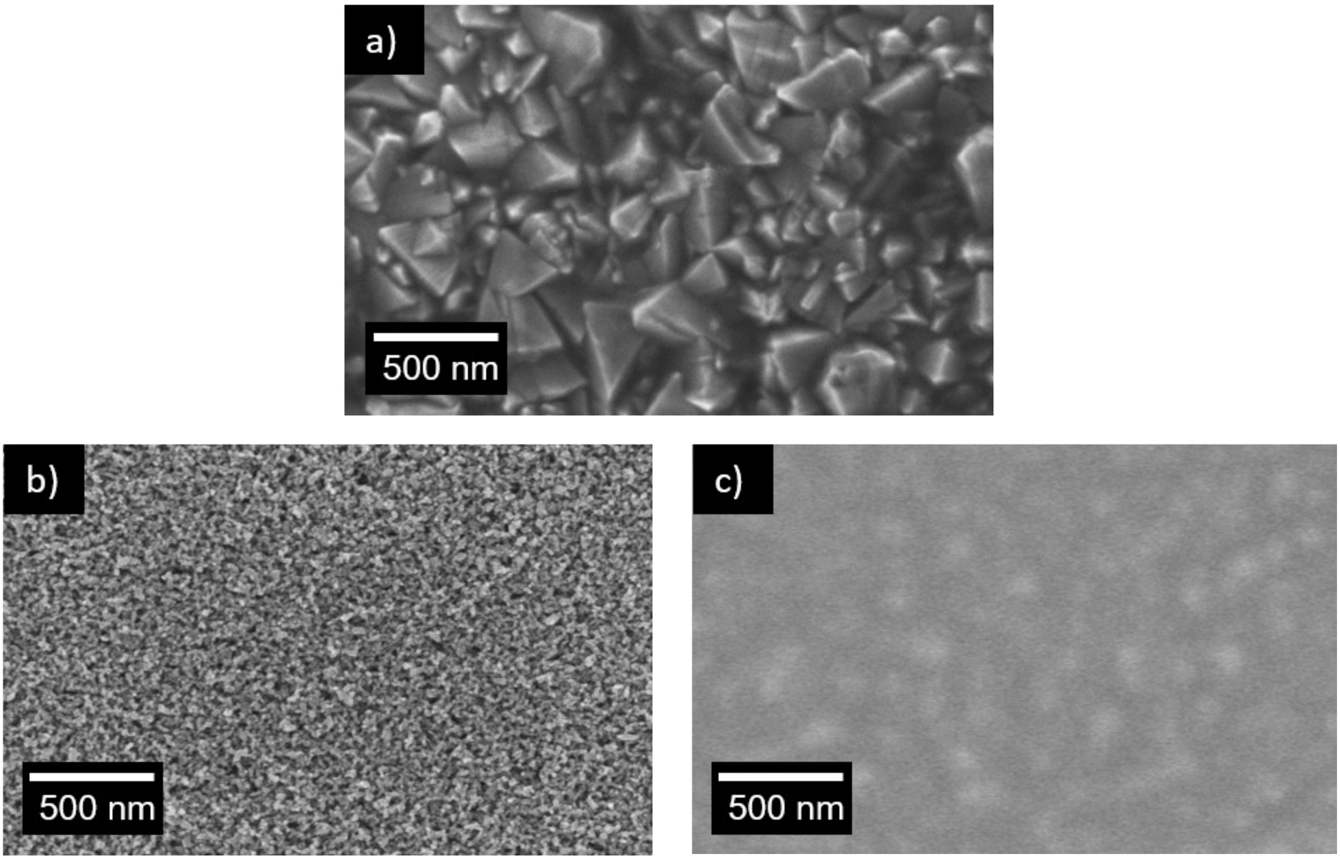

Figure S1. SEM images of a) bare FTO substrate, b) mesoporous TiO_2 and c) TiO_2 compact layer on top of FTO glass.

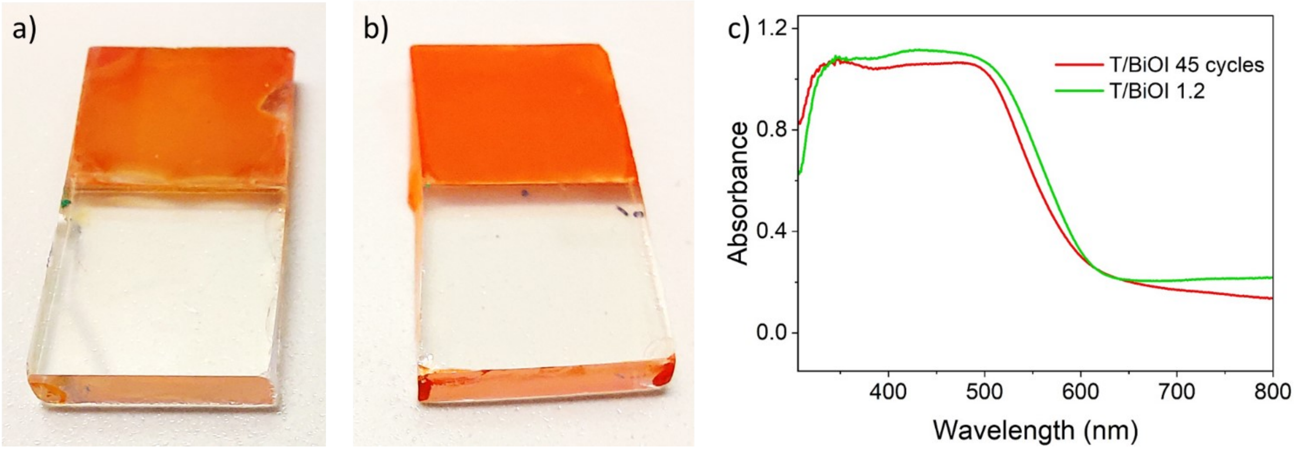

Figure S2. Optical images of a) T/BiOI 45 cycles and b) T/BiOI 1.2. c) UV-Vis spectra converted in absorbance from DRS.

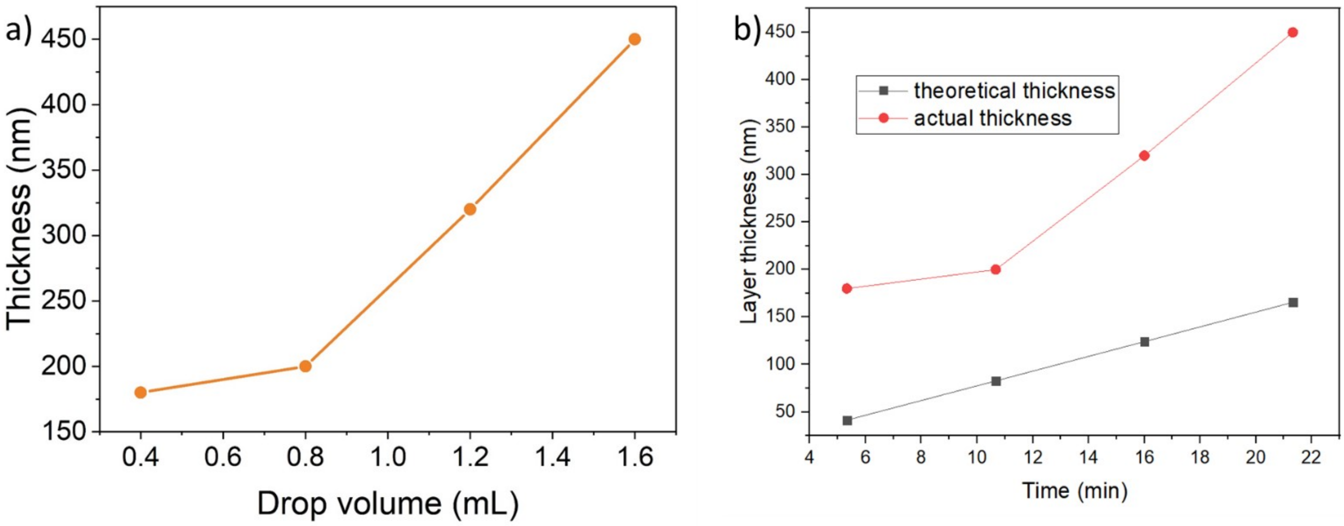

Figure S3. a) Relationship between the BiOI film thickness and the drop volume of the precursor solutions. b) Relationship between the BiOI film thickness and the coating time.

The theoretical thickness of the BiOI layer is calculated as follows:

It is known that the drop rate of the precursors is 75 µL/min, the concentration of the precursors is 5 mM, the atomic mass of BiOI is 351.88 g/mol.

We assume that 95% of the precursor is wasted during the spin-coating process, then the remained BiOI should be 6.6 µg/min.

The density of BiOI is 8.5 g/cm^3 and the thickness of one layer of BiOI is 0.94 nm. We assume that all the above BiOI is perfectly aligned on the 1 cm^2 substrate, then, in 1 min, there should be at least 8.26 layers of BiOI grown on the substrate.

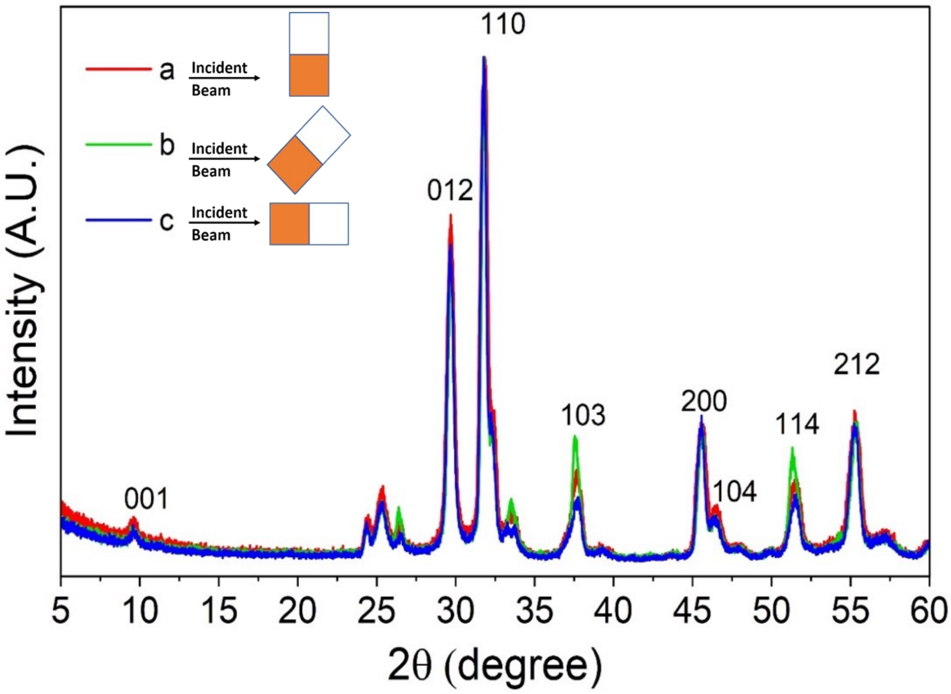

Figure S4. XRD patterns of T/BiOI 1.2 obtained by changing the relative position of the incident beam by 45° between the different diffractograms in the figures. The 2 main reflection peaks maintain the same relative intensity for the same sample regardless of the relative position of the film, rotated at 45° and 90° from the initial position in the XRD sample holder. It is thus possible to assume that the growing BiOI on the surface forms from the 012 plane.

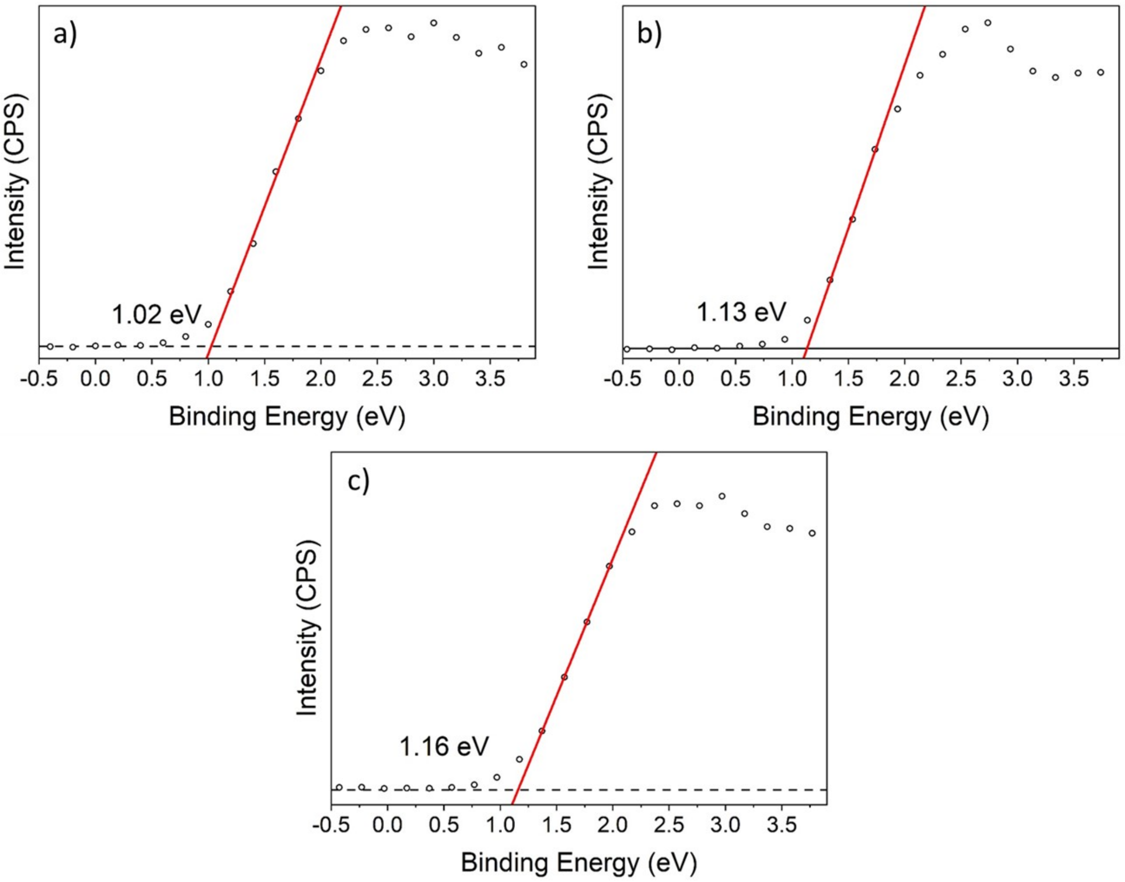

Figure S5. XPS spectra of a) T/BiOI 0.4, b) T/BiOI 0.8 and c) T/BiOI 1.6 in the region of the VBM. The binding energy scale is reported with respect to E_F. The VBM occurs at the intersection of a line fit to the linear portion of the leading edge and the extended background line between the VBM and E_F.

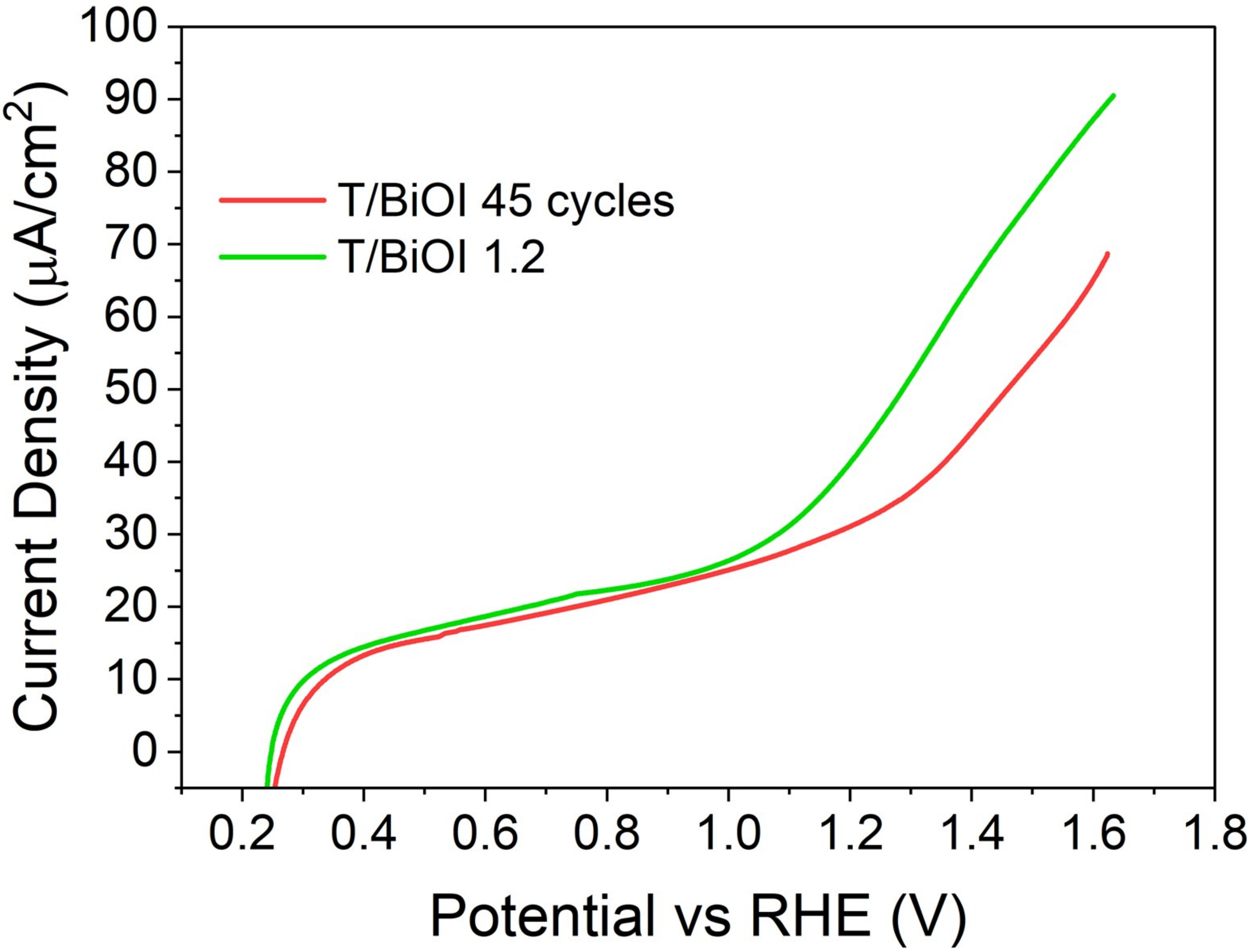

Figure S6. LSV of T/BiOI 45 and T/BiOI 1.2.

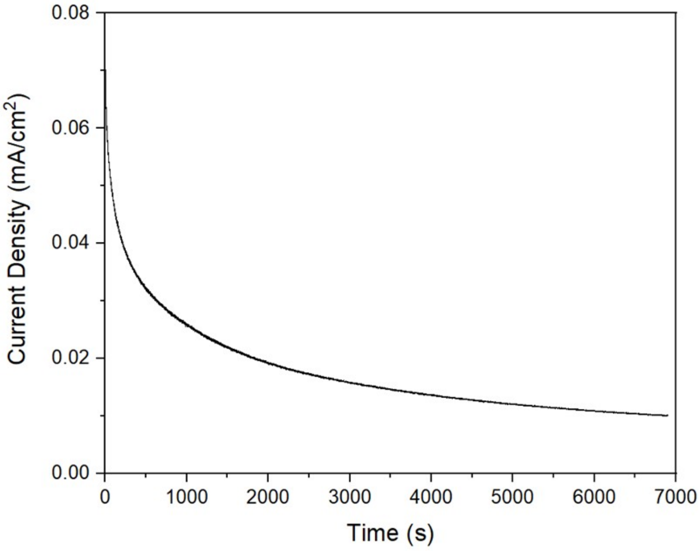

Figure S7. Chronoamperometry at 1.23 V vs RHE of the T/BiOI 1.2 film with a 20 nm ALD Al_2O_3 protection layer. The chronoamperometry was measured under Xenon arc lamp with an LSZ189 AM 1.5G filter with an intensity set to 100 mW cm^{-2}.

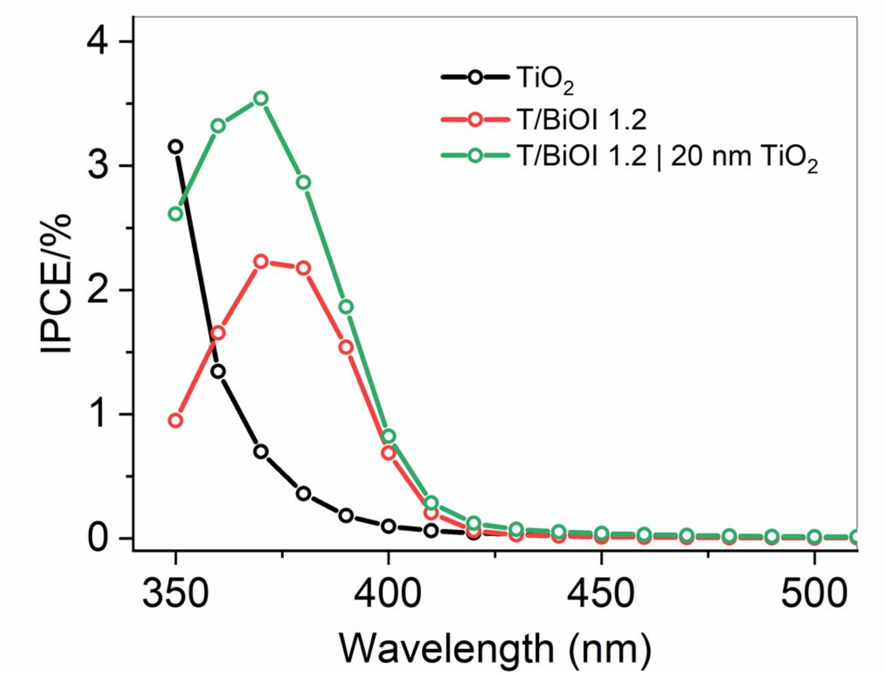

Figure S8. IPCE spectra of T/BiOI 1.2 with and without the TiO_2 protective layer deposited via ALD.