

## Supplementary Information:

### Electronic and structural characteristics of a polycrystalline $\text{IrO}_2\text{:Li}/(100)$ -oriented Si pn heterojunction

#### 1. $\text{IrO}_2\text{:Li}$ - metal contact I-V characteristics

Figure S1 shows the  $I$ - $V$  measurement for the metal contacts of Au/Ti for p-type  $\text{IrO}_2\text{:Li}$  to verify ohmic behavior. Au/Ti pads of  $1 \times 1$  mm (separated by 3 mm) were formed on the  $\text{IrO}_2\text{:Li}$  film via lift-off.

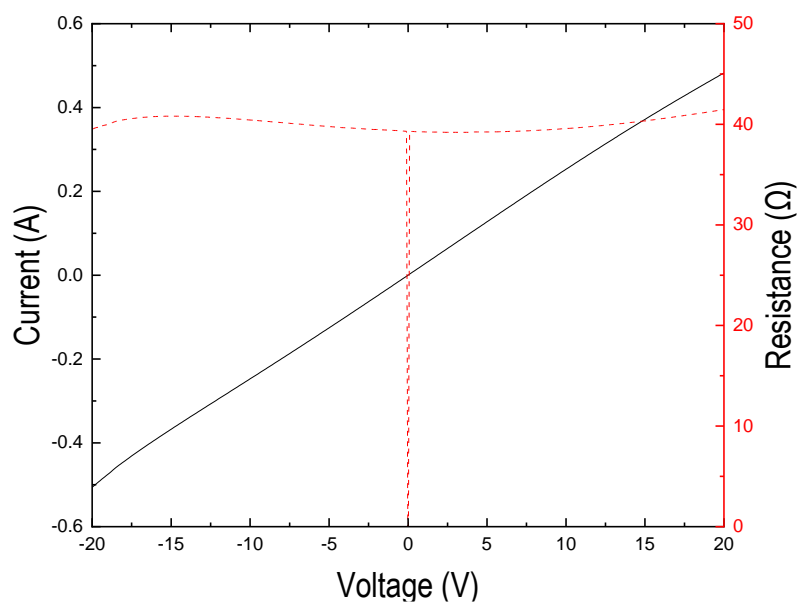


Fig. S1. Current and resistance versus voltage for Au/Ti contact on  $\text{IrO}_2\text{:Li}$

## 2. IrO<sub>2</sub>:Li – EELS analysis

Minor differences are observed between the EELS signal from the interfacial layer near the substrate and that from the bulk of the IrO<sub>2</sub>:Li film. The density of states (DOS) distributions for the IrO<sub>2</sub>:Li film are extracted from EELS. Sub-bandgap states may be attributed to grain boundaries as well as other defects in the IrO<sub>2</sub>:Li film.

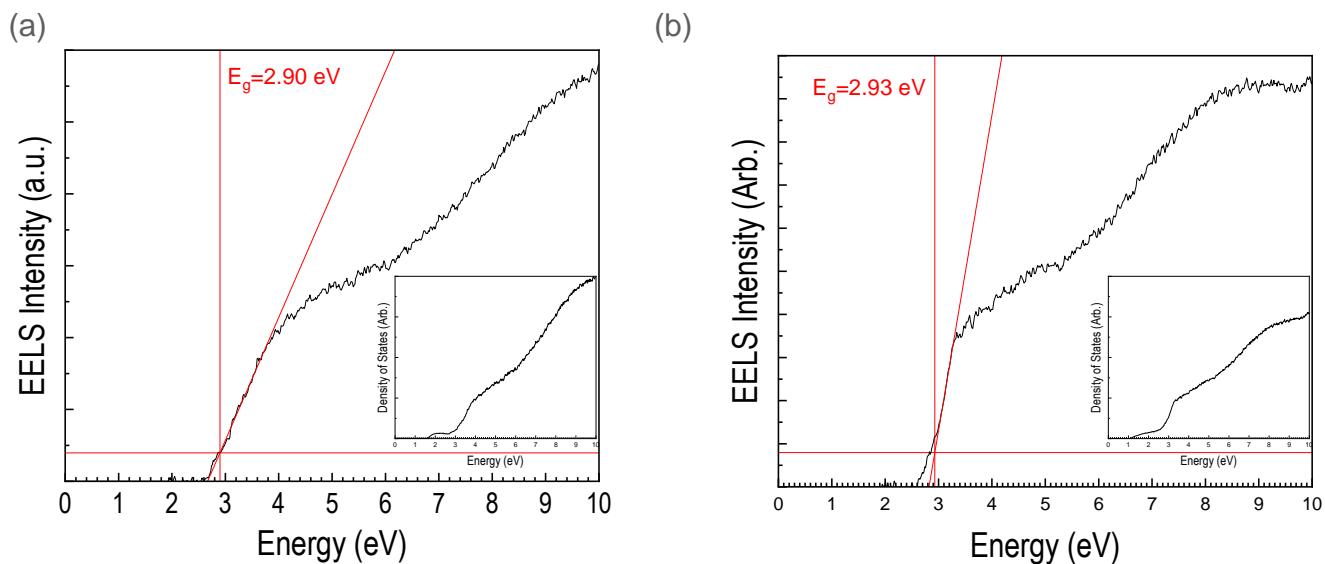


Fig. S2. EELS spectra extracted from (a) the bulk region of the IrO<sub>2</sub>:Li film and (b) the interfacial oxygen deficient IrO<sub>2</sub>:Li. The insets show the extracted density of states distributions.

### 3. STEM-EDS elemental mapping at the interface

Figure S3 (a) shows EDS area mapping at the interface between  $\text{IrO}_2\text{:Li}$  film and intrinsic Si substrate. No interdiffusion of Si and Ir atoms is observed across the interface. Figure S3 (b) highlights the difficulty of detecting the Li content in the  $\text{IrO}_2\text{:Li}$  film using EDS due to the overlap between the signal peaks for Ir and Li.

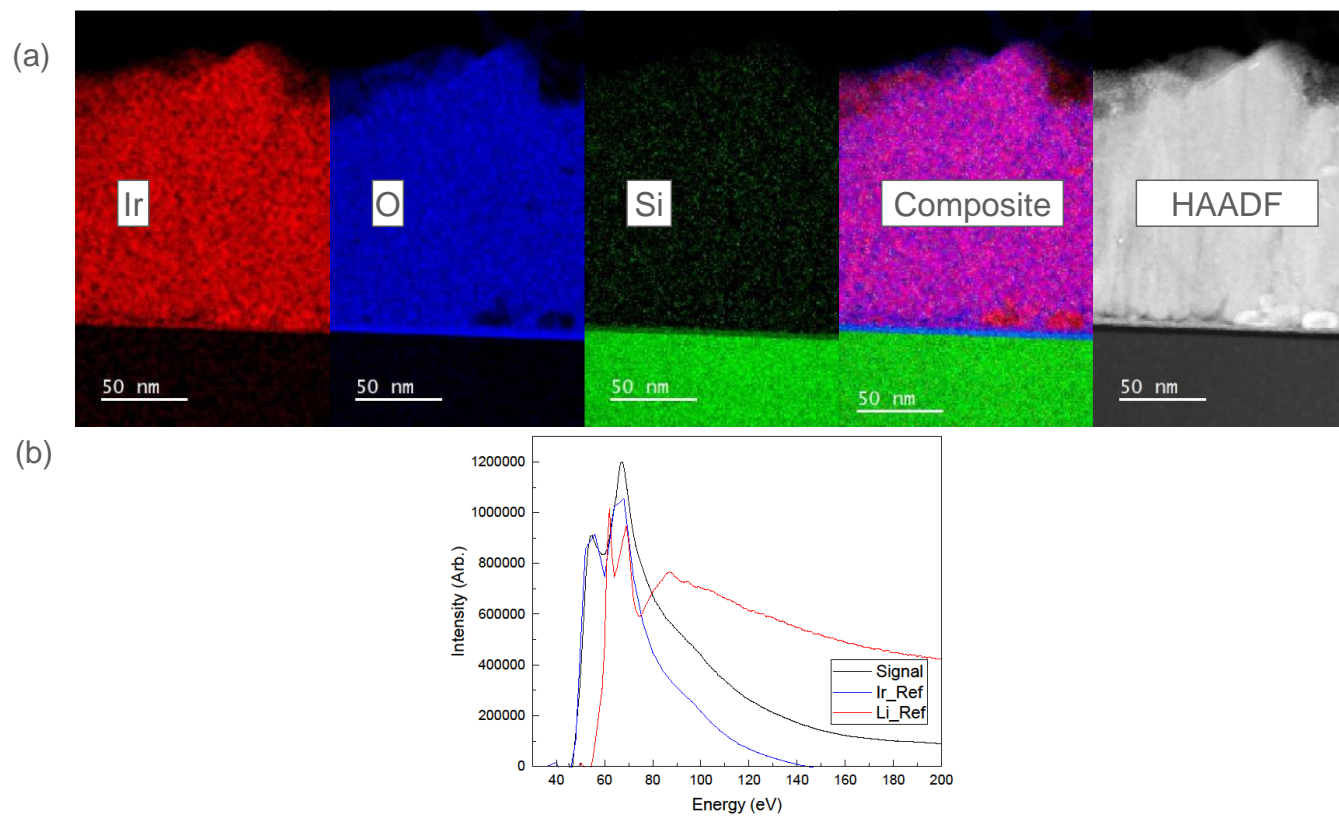


Fig. S3. (a) EDS elemental mapping at the  $\text{IrO}_2\text{:Li}$ /Si heterointerface. (b) EDS point spectrum from the  $\text{IrO}_2\text{:Li}$  film compared to Ir and Li reference spectra. (The reference signals for Ir and Li are scaled to match the film signal intensity level).