Supporting Information

Oxygen-Induced Reversible Sn-Dopant Deactivation between Indium Tin Oxide and Single-Crystalline Oxide Nanowire Leading to Interfacial Switching

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Contents

XRD Pattern of ATO Thin Film Treated by Air-Annealing

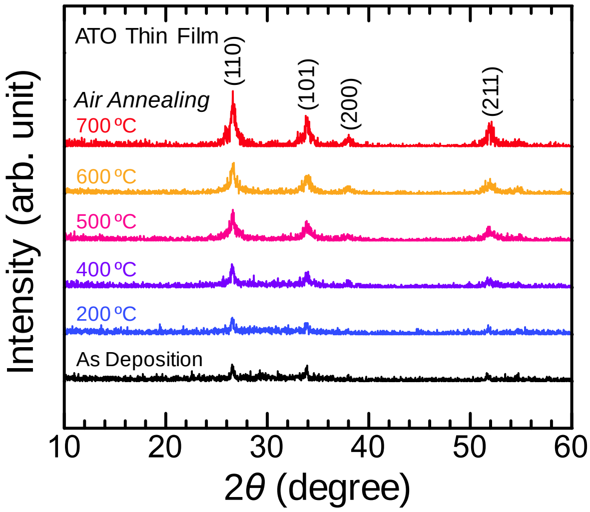

Figure S1. X-ray diffraction (XRD) patterns of ATO thin film for both as-deposited and air-annealed (200–700 °C, 10 min) samples.

Annealing Time Dependence of *I-V* Characteristics

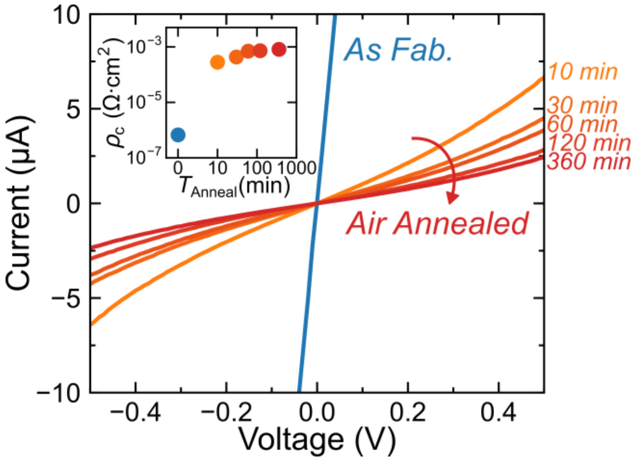

Figure S2. *I–V* characteristics of single-crystalline ATO channel device with ITO electrodes under varied durations of air annealing at 400 °C. Air-annealing (400 °C) time (T_{anneal}) dependence of ρ_c is shown in the inset.

Contact Resistivity Change of Polycrystalline ATO Channel Device

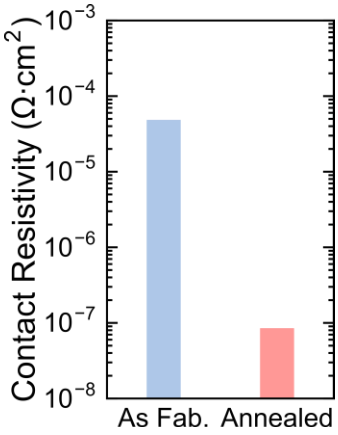

Figure S3. Contact resistivity of polycrystalline ATO channel device with ITO electrodes, including both as-fabricated and air-annealed (400 °C, 10 min) devices.

Dependence of Nanowire Resistivity on Oxygen Pressure during Annealing

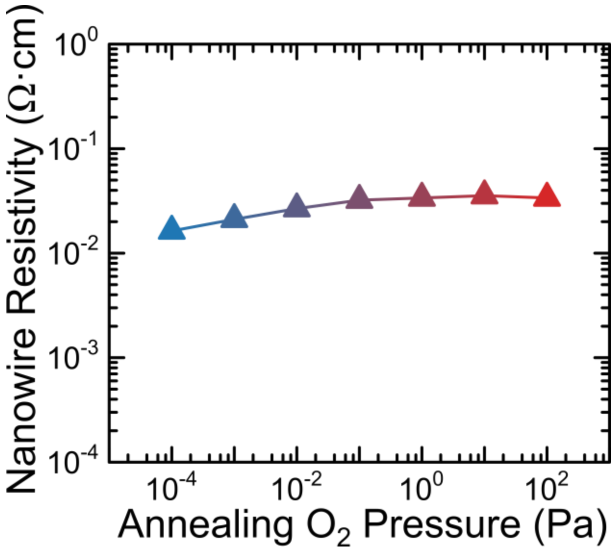

Figure S4. Annealing oxygen pressure dependence of nanowire channel resistivity of ITO-contacted single-crystalline ATO channel device with ITO electrodes. The annealing was performed at 400 °C for 10 min.

Single-Crystalline ITO Film Devices

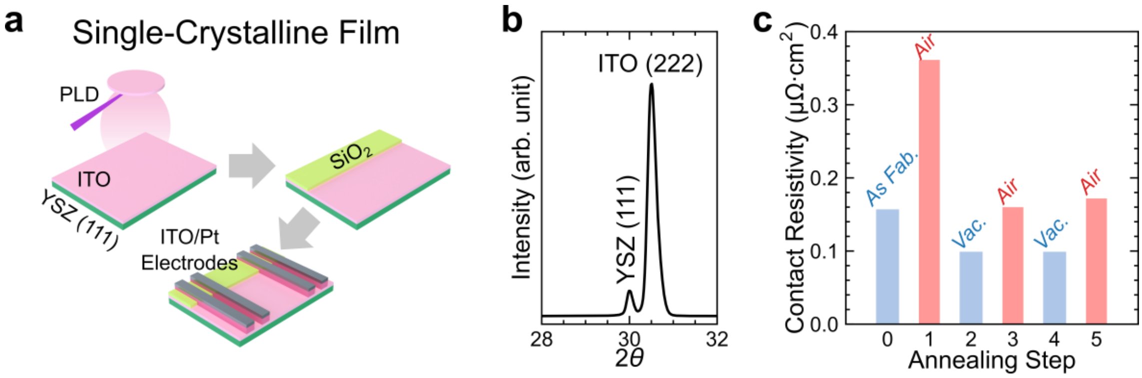

Figure S5. (a) Schematic images of single-crystalline ITO film device fabrication on an yttria-stabilized zirconia (YSZ) (111) substrate. (b) XRD pattern of an ITO thin film deposited by pulsed-laser deposition (PLD) on a YSZ (111) substrate. (c) Contact resistivity of single-crystalline ITO film device with ITO electrodes under sequential annealing steps, all at 400 ºC for 10 min, alternately performed in air and under vacuum. We fabricated The PLD-deposited ITO film channel on yttria-stabilized zirconia (YSZ) (111) substrates were utilized as an oxide channel because of its good crystallinity, with nearly single-crystalline structures,[1,2] as confirmed by the XRD patterns (Fig.S5b).

References

(1) Kim, H.; Gilmore, C. M.; Piqué, A.; Horwitz, J. S.; Mattoussi, H.; Murata, H.; Kafafi, Z. H.; Chrisey, D. B. Electrical, Optical, and Structural Properties of Indium-tin-oxide Thin Films for Organic Light-emitting Devices. *J. Appl. Phys.* **1999**, *86* (11), 6451–6461.

(2) Ohta, H.; Orita, M.; Hirano, M.; Hosono, H. Surface Morphology and Crystal Quality of Low Resistive Indium Tin Oxide Grown on Yittria-stabilized Zirconia. *J. Appl. Phys.* **2002**, *91* (6), 3547–3550.