Supplementary Materials

Thermo-compressive transfer printing for facile alignment and robust device integration of nanowires

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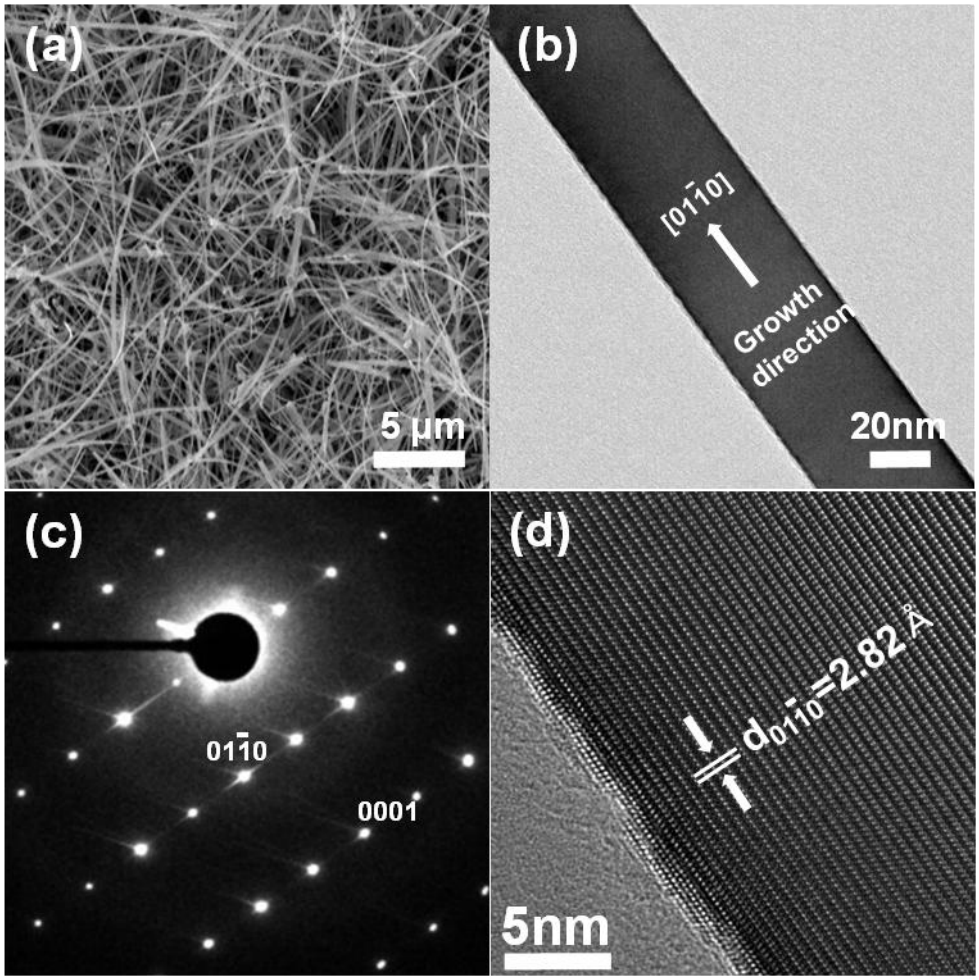

Fig. S1 SEM and TEM analysis of Sn-doped ZnO nanowire: (a) SEM image of randomly grown Sn-doped ZnO NWs on Si substrate. The range of the diameter of the ZnO NWs is 40-100nm. (b) HRTEM image of a piece of ZnO NWs and (c) its SAED pattern showing growth direction[01-10]. (d) Atomic-resolved image shows that the distance between adjoining (01-10) planes is 2.82Å.

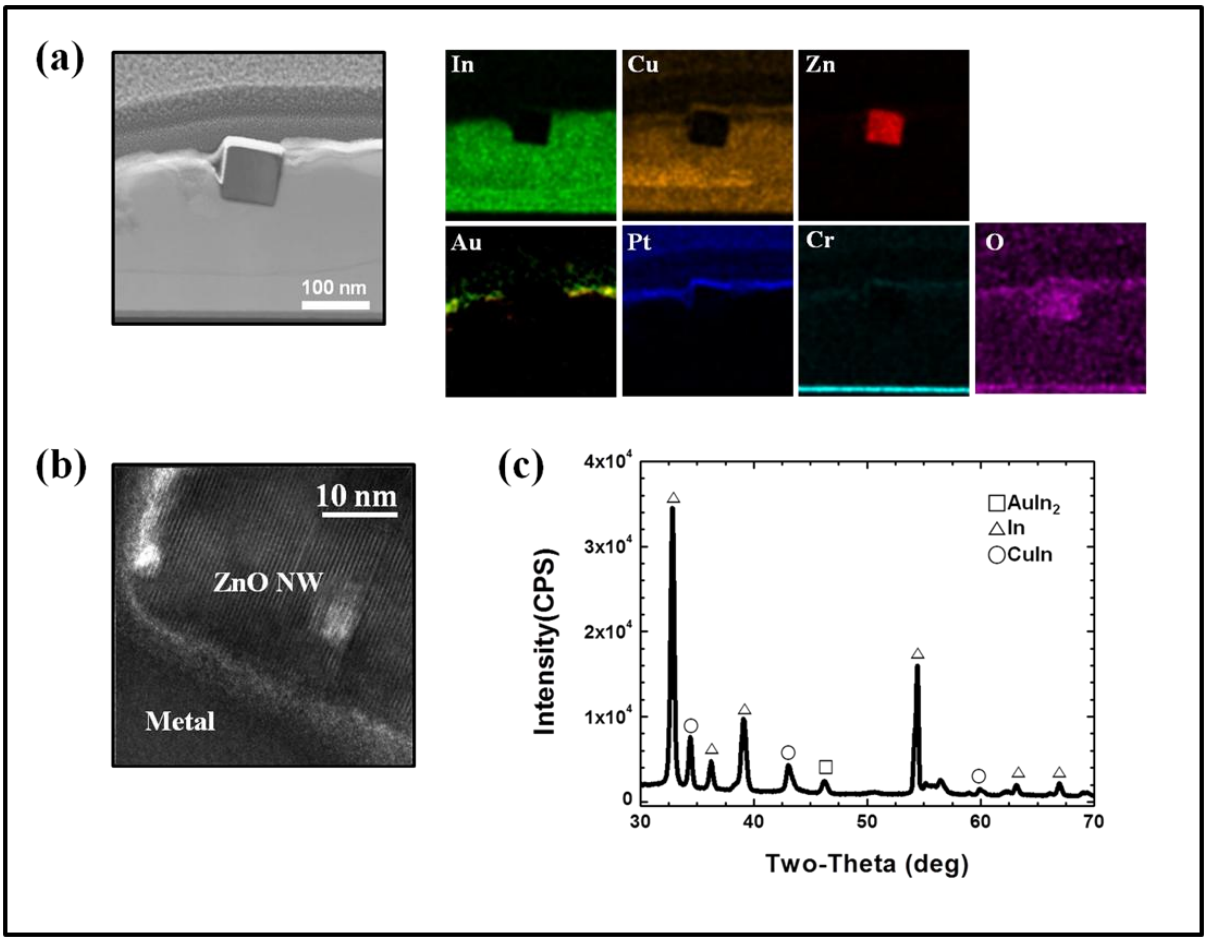

Fig. S2 Microstructural characterization of ZnO NWs on Cr/Cu/In/Au electrode: (a) TEM image and EDS analysis of the cross-section of the contact between ZnO NW and metal electrode. (b) HRTEM image of the contact region. (c) XRD analysis on Cr/Cu/In/Au metal electrode.

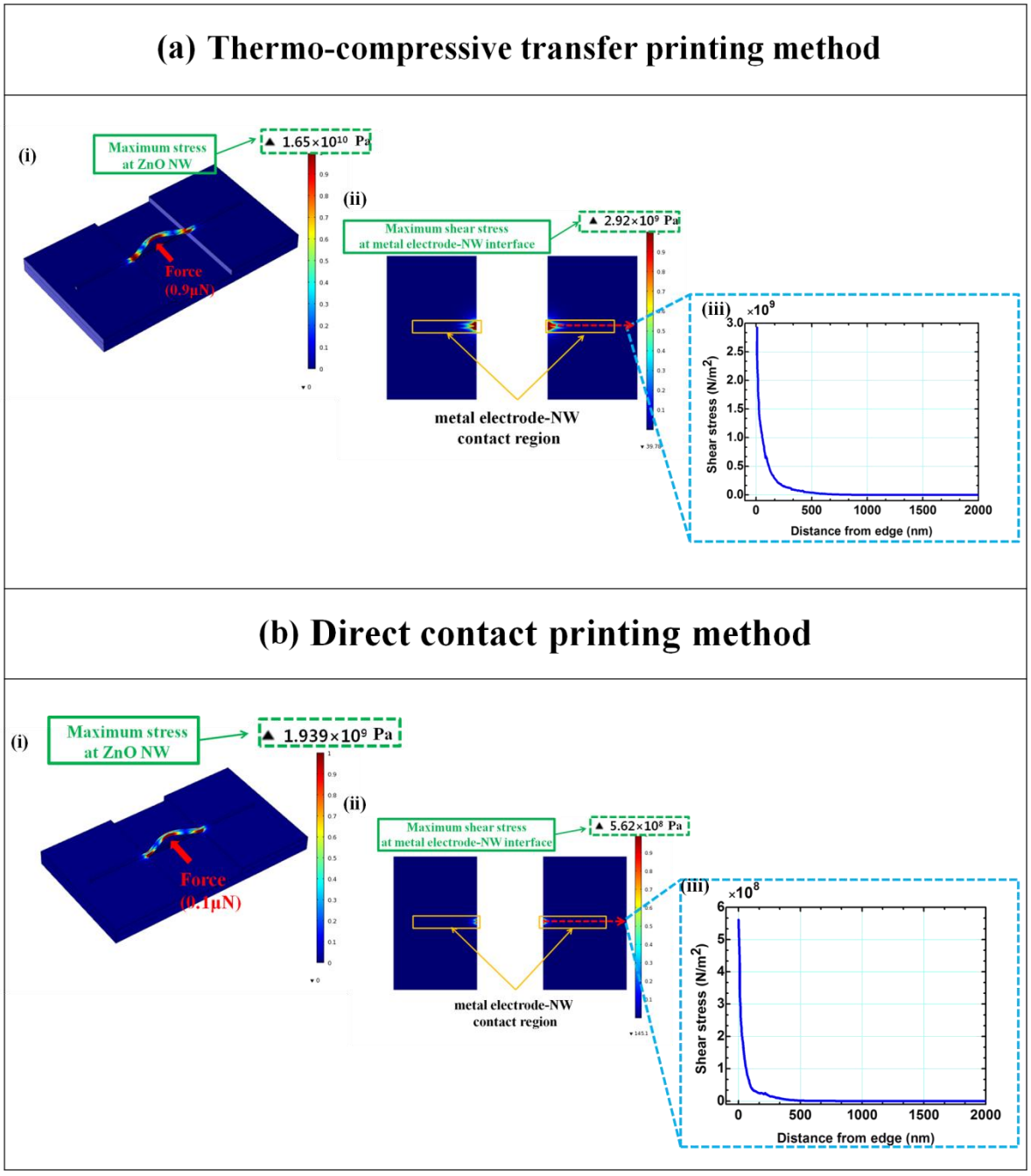

Fig. S3 Numerical simulation of lateral force microscopy (LFM) test of ZnO NWs on metal electrodes: transverse loading of (a) 0.9 μN and (b) 0.1 μN were applied to the center of ZnO NW at the point of failure for thermo-compressive transfer printing and direct contact printing, respectively. Panels (i) and (ii) show the stress distributions on the ZnO NW and metal electrode, respectively. For both (a) and (b) the maximum shear stress at the metal electrode-NW interface occurs at the inner edge of the bonding surface. The maximum and average shear stresses are 2.92 GPa and 22.7 MPa for thermo-compressive transfer printing. These values are 562 MPa and 4.1 MPa for direct contact printing.

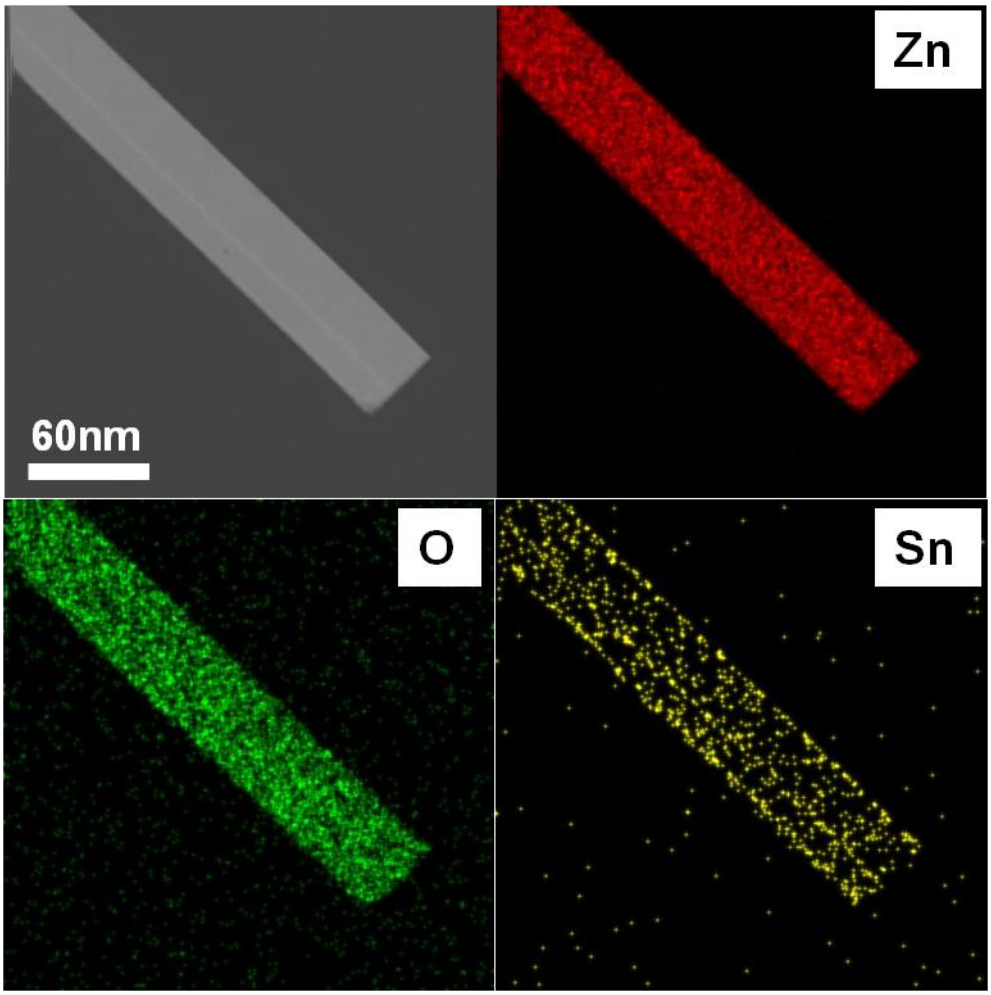

Fig. S4 TEM-EDS analysis of Sn-doped ZnO NW shows a uniform distribution of Zn, O, and Sn throughout the entire ZnO NW.

Table S1. Weight composition of Sn-doped ZnO NWs by SEM-EDS analysis. The range of Sn content is 1~2%

	wt.%	at.%
Zn	83.59	57.05
Sn	1.17	0.45
O	15.24	42.50

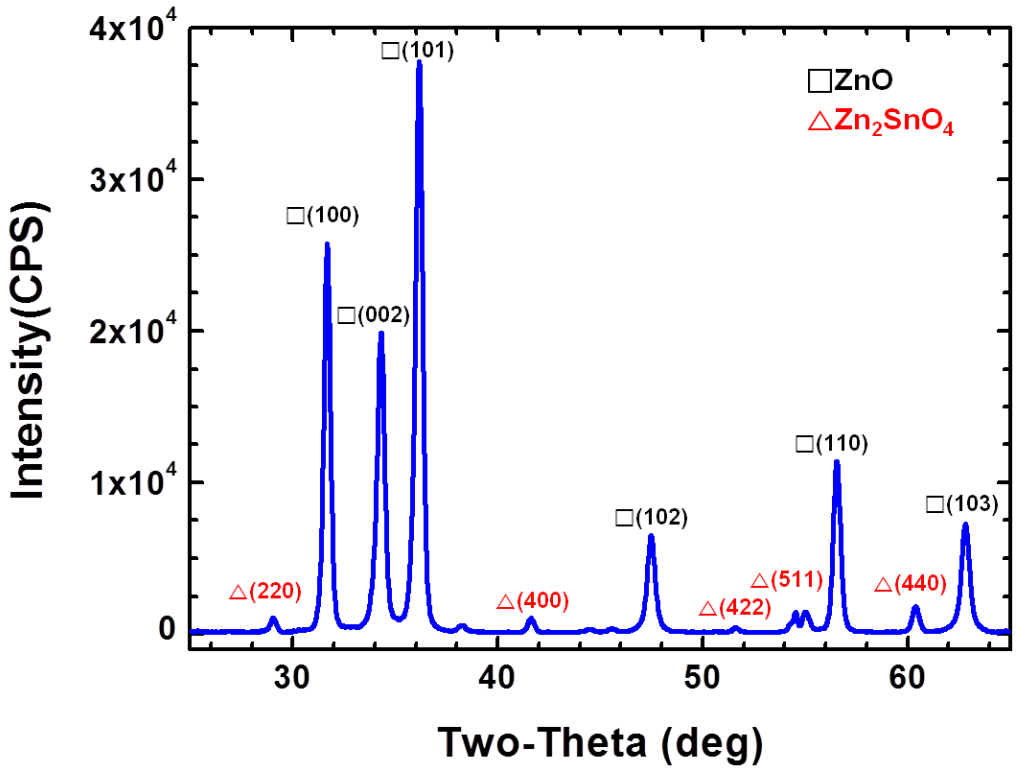

Fig. S5 X-ray diffraction patterns of Sn-doped ZnO nanowire

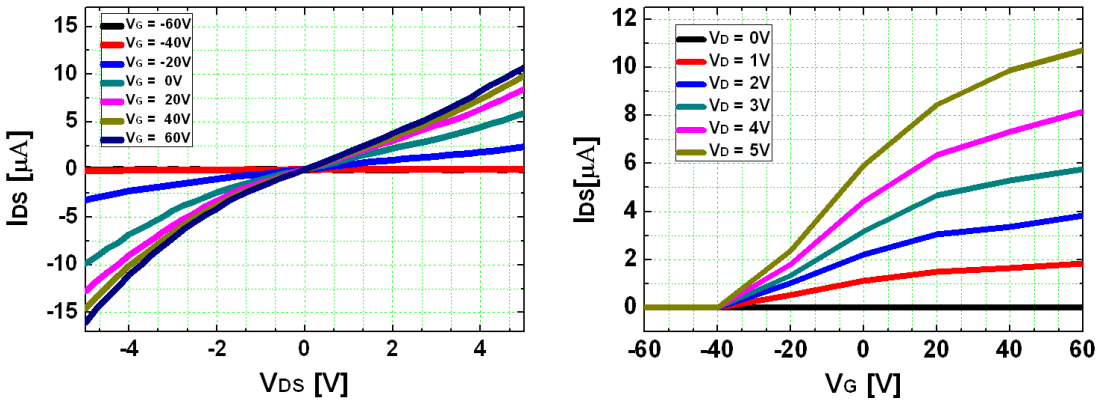

Fig S6. Electrical characteristics of ZnO NW-based FET device on Cr/Cu/In/Au electrode: (a) I_D-V_{DS} curves at different V_G (b) I_D-V_G curves at different V_{DS}