Electronic Supplementary Material (ESI) for Nanoscale Advances.

Supplementary Information

Fig. S1 reports the RBS experimental spectrum (black line) and the RUMP code simulation (red line) of the Co_3O_4 thin film deposited on a carbon substrate. The arrows indicate the surface edges for C, O and Co. Carbon substrate is chosen because its lightweight enables clear and accurate detection of all the heavier elements, including O. The spectrum indicates the presence of a Co_3O_4 very thin layer. Both the stoichiometry and the thickness of the film can be deduced from the experimental spectrum, by overlapping the simulation. A Co:O=3:4 stoichiometry is measured, within the experimental uncertainty of the technique. The thickness is estimated by converting the areal density (the natural unit of measurement for RBS) into thickness, under the hypothesis of a nominal density of the Co_3O_4 film of 6.11 g/cm^3. The measured thickness of the layer is equal to (6.5±0.5) nm.

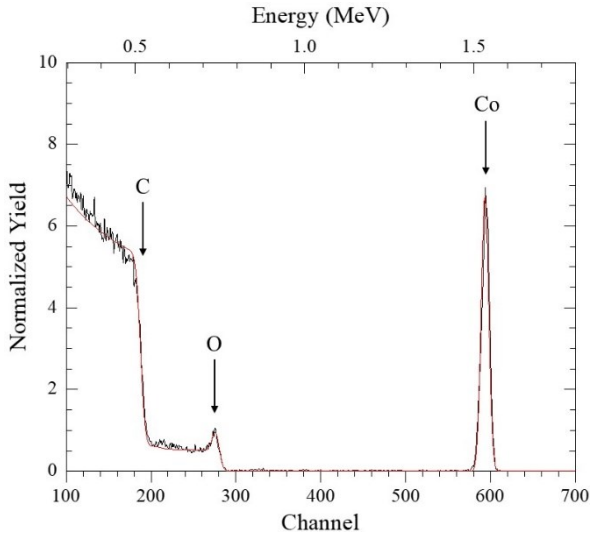

Fig.S1. The RBS spectrum of Co_3O_4 thin film. Black line shows the experimental spectrum and the red line shows RUMP code simulation. The vertical arrows indicate the surface edges for C, O and Co.

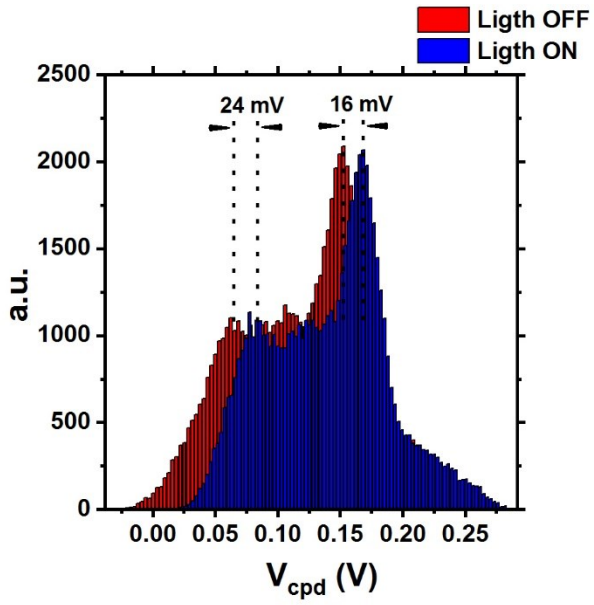

Fig.S2. The histogram of V_{cpd} values under dark and illumination condition, as evaluated from V_{cpd} maps in Figure 3 (b,e).

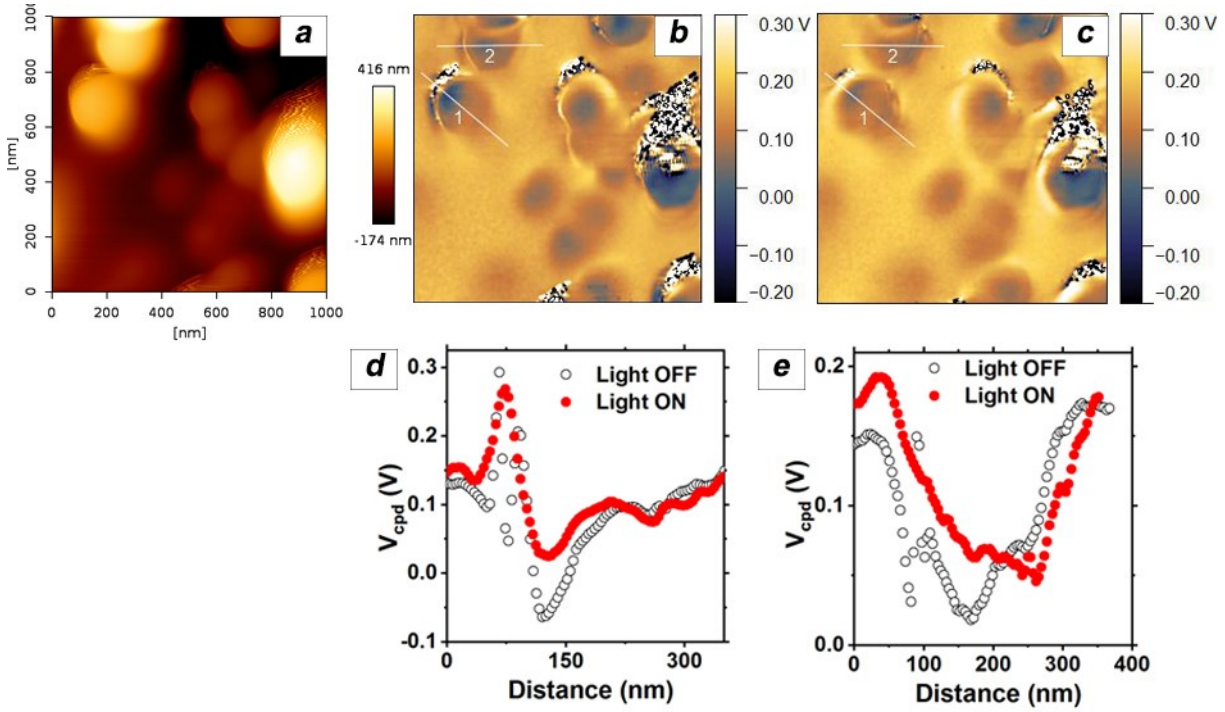

Fig.S3. V_{CPD} images of the p-n junction NRs measured with ImEFM under no light illumination (b) and under light illumination (c) at 1 µm by 1 µm area. The potential distribution across the two NRs taken along white lines shown in (b,c) are presented in (d,e). The cross-section image (d) corresponds to the line 1 in (b, c). The corresponding topography image is shown in (a).

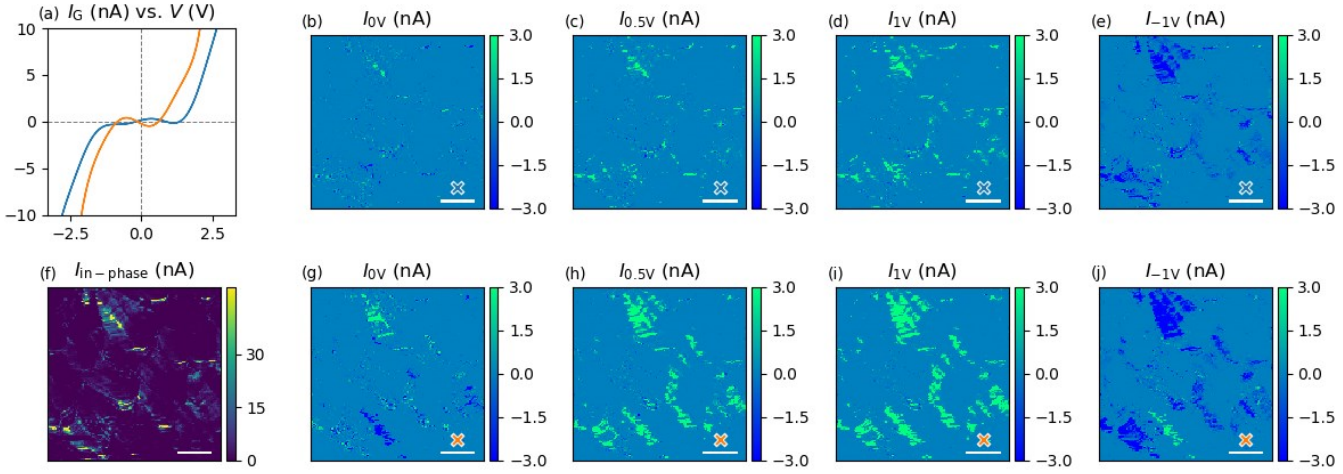

Fig.S4. Larger area with NRs measured with ImCFM. Current maps measured at 0, 0.5, 1, and -1 V with ImCFM with no illumination (upper row, b, c, d and e) and under illumination (bottom row, g, h, I and j). The measured raw data (in-phase current) is shown in (f). Corresponding I-V curves taken at orange and blue marks are shown in (a). The blue mark shows the I-V curve measured under no illumination, while the orange is measured under illumination at the same location. The current scale for the maps (b-e and g-j) was set to 3 nA to highlight the small changes in the maps, while the actual measured currents were larger as shown in IV curves (a). The scale bar in the image is 200 nm.

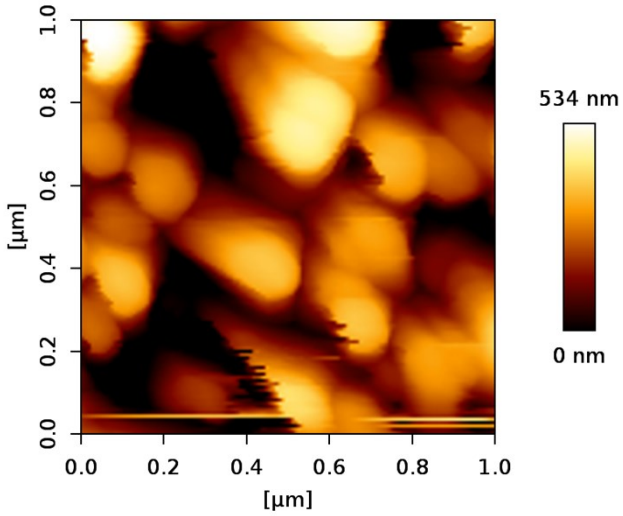

Fig.S5. Topography images of grown ZnO NRs with deposited p-type film of Co_3O_4 on top of them, as measured during ImCFM measurements in contact mode shown in Figure S4.