Supplementary information

AlInGaN nanocrystal seeded growth of weak p-type β-(In_{0.1}Ga_{0.9})₂O₃

nanowires and nanobelts

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SI1. The growth of AlInGaN

The metalorganic vapor phase epitaxy of AlInGaN films was carried out on c-plane sapphire substrates. Trimethylgallium (TMGa), Trimethyl aluminum (TMAl), Trimethylindium (TMIn), and high-purity ammonia were used as the source precursors, and nitrogen as the carrier gas. A GaN template with a thickness of 800 nm was grown by the conventional two-step growth method. The subsequent growth of 2.2 μ m thick AlInGaN epilayers was conducted at 850°C and 50 Torr. More details for the growth of AlInGaN epilayers can be found elsewhere [*J. Cryst. Growth*, 2009, **311**, 474–477].





Figure S1. Scanning electron microscopy (SEM) and X-ray diffraction of AlGaInN films

The lattice parameters of AlInGaN films are estimated to be 3.205 and 5.212 Å corresponding to the a-direction axis and c-direction axis.

SI3. X-ray photoelectron spectroscopy of AlGaInN



Figure S2. X-ray photoelectron spectroscopy spectra of Ga2p3/2, In3d, O1s, and N1s photoelectron peaks from AlInGaN films.

Stoichiometric information of AlInGaN films is identified as Al_{0.2}In_{0.2}Ga_{0.6}N.

SI4. Growth evolution of β-(In_xGa_{1-x})₂O₃



Figure S3. SEM images of β -(In_xGa_{1-x})₂O₃ samples with growth time of 30 (sample A), 60 (sample B), 120 (sample C) mins, respectively.

SI5. Crystal structure of β-(In_xGa_{1-x})₂O₃ nanowires



Figure S4. X-ray diffraction of the sample B.