Supporting Information

Synthesis of In_2O_3 Nanowire-Decorated Ga_2O_3 Nanobelt Heterostructures and Their Electrical and Field-Emission Properties

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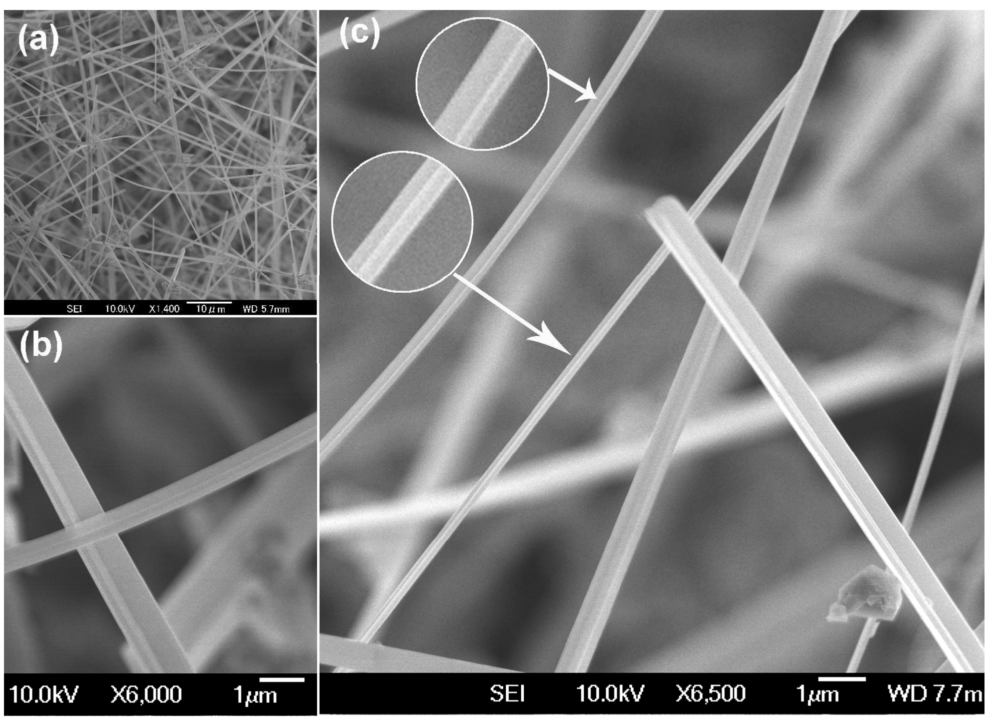

Figure S1. (a) Low- and (b,c) high-magnification SEM images reveal that the product consists of numerous 1D heterostructures .

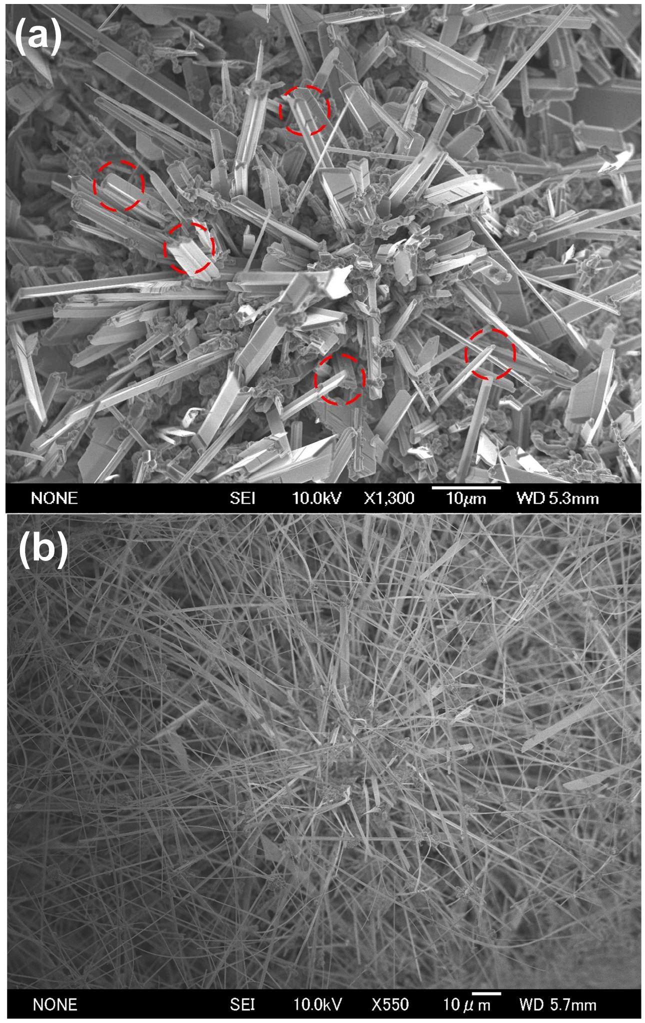

Figure S2. SEM images of products synthesized over different reaction times. (a) After reaction for 10 min. The image clearly shows many 1D heterostructures with short lengths grow on the copper foil substrate, indicating that the heteroepitaxial growth of heterostructures occurred at very early stages of the reaction process. (b) After reaction for 1 h. The final product consists of numerous heterostructures with high aspect ratio.

Standard Ga_2O_3 nanobelts were also synthesized under the same reaction conditions but without the use of the In reactant. Then FETs based on individual pure Ga_2O_3 nanobelt were fabricated, as shown in Figure S2(a). Figure S2(b) presents the I_{ds}-V_{ds} curve recorded on a representative single Ga_2O_3 nanobelt FET. It clearly shows that the resistance of pure Ga_2O_3 nanobelt is much higher than that of In_2O_3/Ga_2O_3 heterostructure. The electrical properties of pure Ga_2O_3 nanobelt were also studied using similar model for calculations. The resistivity of the nanobelt was estimated to be 10.87 Ω • cm. An electron concentration value of $1.77*10^{17}$ cm^{-3} and mobility value of 3.2 cm^2 V^{-1} S^{-1} were estimated for this pure Ga_2O_3 nanobelts. Compared with those numbers in In_2O_3/Ga_2O_3 heterostructure, both the electron concentration and mobility are much lower in the pure Ga_2O_3 nanobelt.

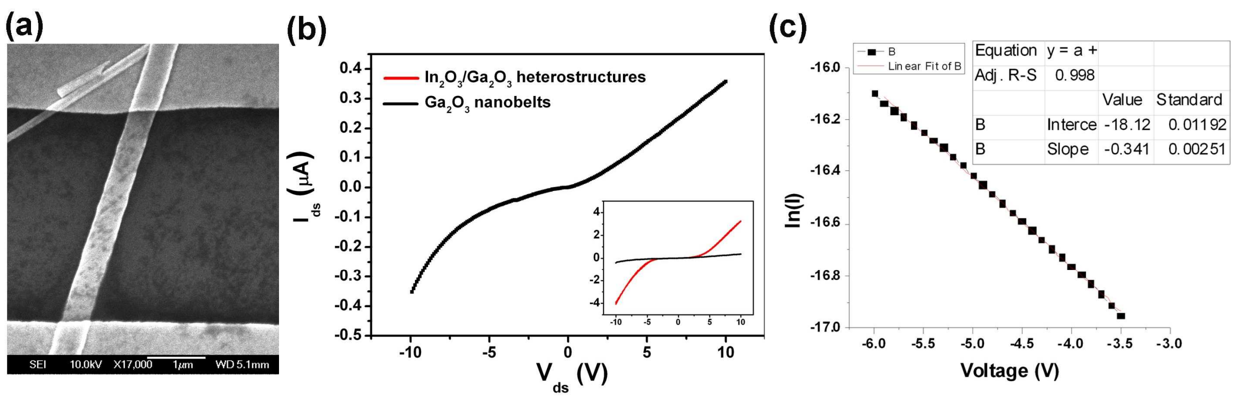

Figure S3. (a) SEM image of a Ga_2O_3 nanobelt-based FET. (b) I_{ds}-V_{ds} curves measured with V_g = 0 V. (c) Experimental and fitted ln$I$ vs V plots at an intermediate bias using the I-V curve in (b).