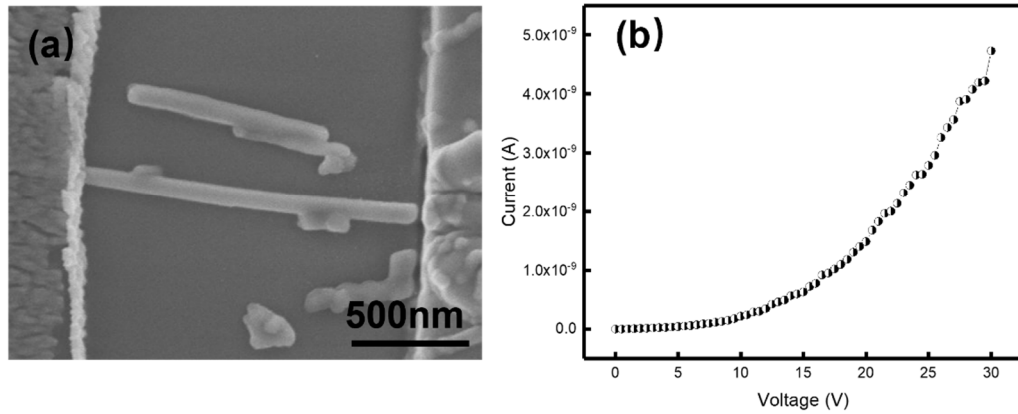


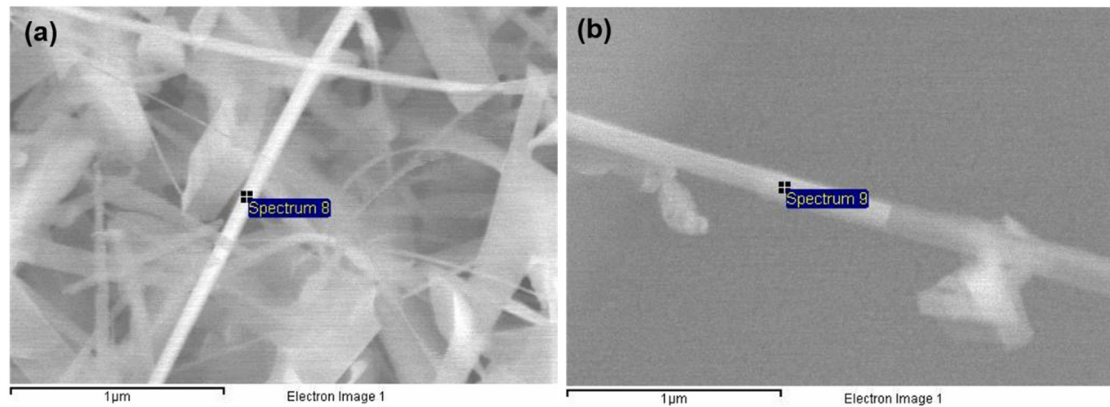
## Support information

Figure S1 demonstrates SEM images of field emission devices prepared based on  $\beta$ -Ga<sub>2</sub>O<sub>3</sub> nanowires and their electrical characteristics. Figure S1 (a) shows the SEM image of the field emission device based on  $\beta$ -Ga<sub>2</sub>O<sub>3</sub> nanowires. Figure S1 (b) illustrate their electrical properties.



**Figure S1.** (a) field emissions device based on  $\beta$ -Ga<sub>2</sub>O<sub>3</sub> nanowires (b) electrical properties of field emission device

Figure S2 shows EDX spot scan area on different substrates, Figure S2(a) is the EDX spot scan area of Ga<sub>2</sub>O<sub>3</sub> nanowires grown on unannealed Al<sub>2</sub>O<sub>3</sub>-film/Si substrate, and Figure S2(b) is the EDX spot scan area of the ultra-long nanowires grown on Al<sub>2</sub>O<sub>3</sub>-film/Si substrate after oxygen annealing.



**Figure S2.** EDX spot scan area of (a) Ga<sub>2</sub>O<sub>3</sub> nanowires grown on an unannealed Al<sub>2</sub>O<sub>3</sub>-film/Si substrate (b) ultra-long nanowires grown on annealed Al<sub>2</sub>O<sub>3</sub>-film/Si substrate