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Polarization Detection of Deep-ultraviolet Light with Monoclinic Gallium Oxide Nanobelts

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Supporting information table of contents

S1. Screenshot of AFM measurement for the determination nanobelt thickness.

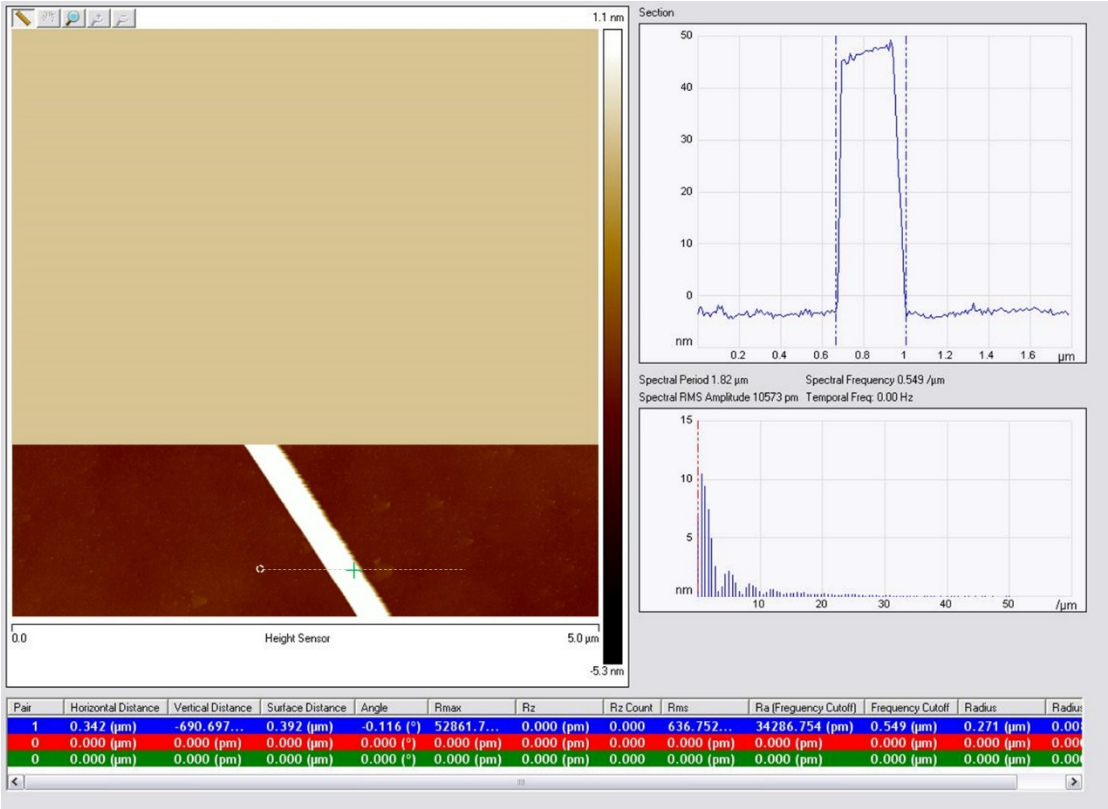


Figure S1 According to the AFM measurement, the thickness of a typical Ga_2O_3 nanobelt is around 50 nm and the width is approximately 280 nm. (The measurement was stopped before it was fully completed at that time, as the value of the thickness could be read out already.)

S2. HRTEM and FFT conducted at different spots on the nanobelt.

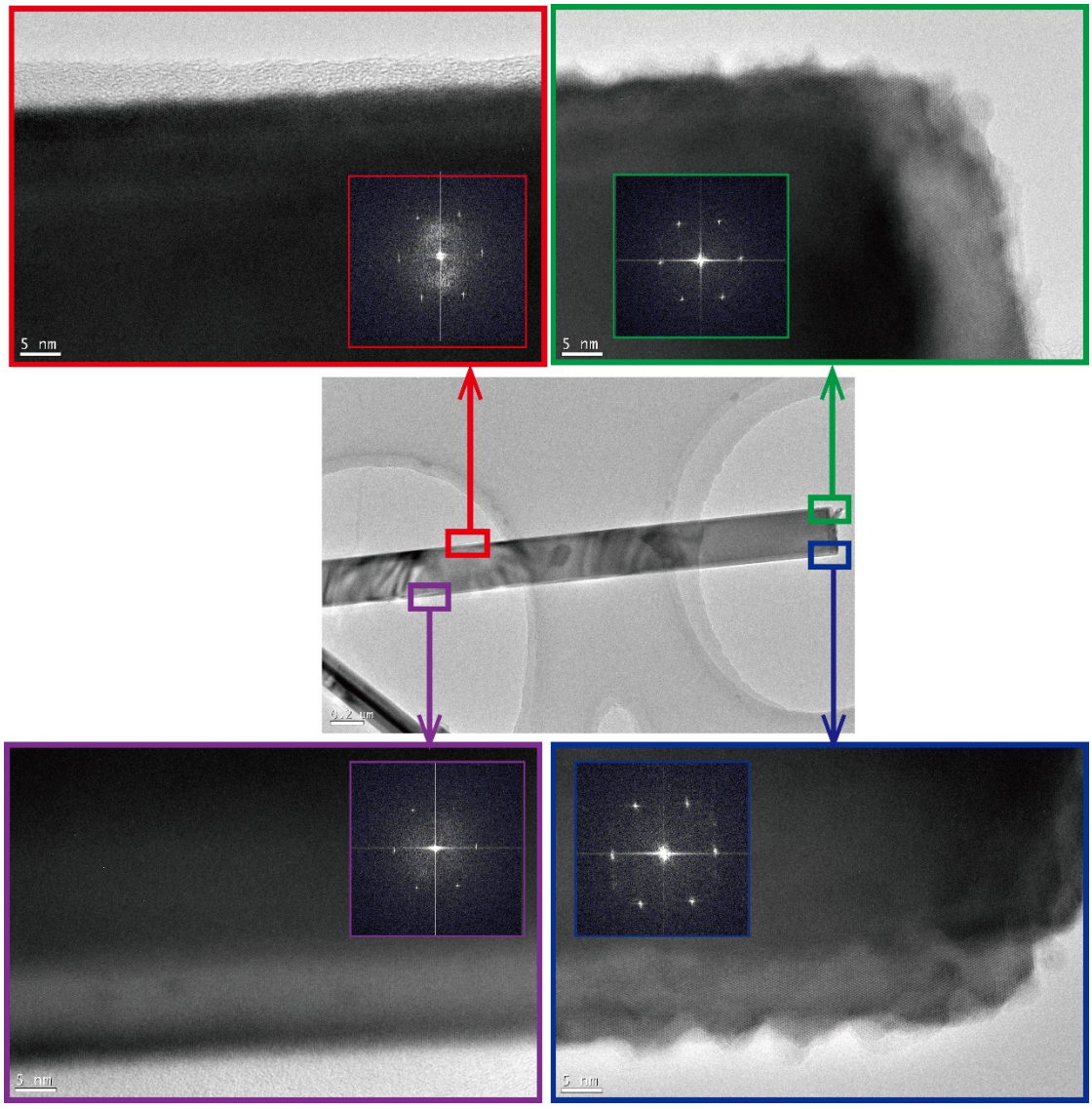
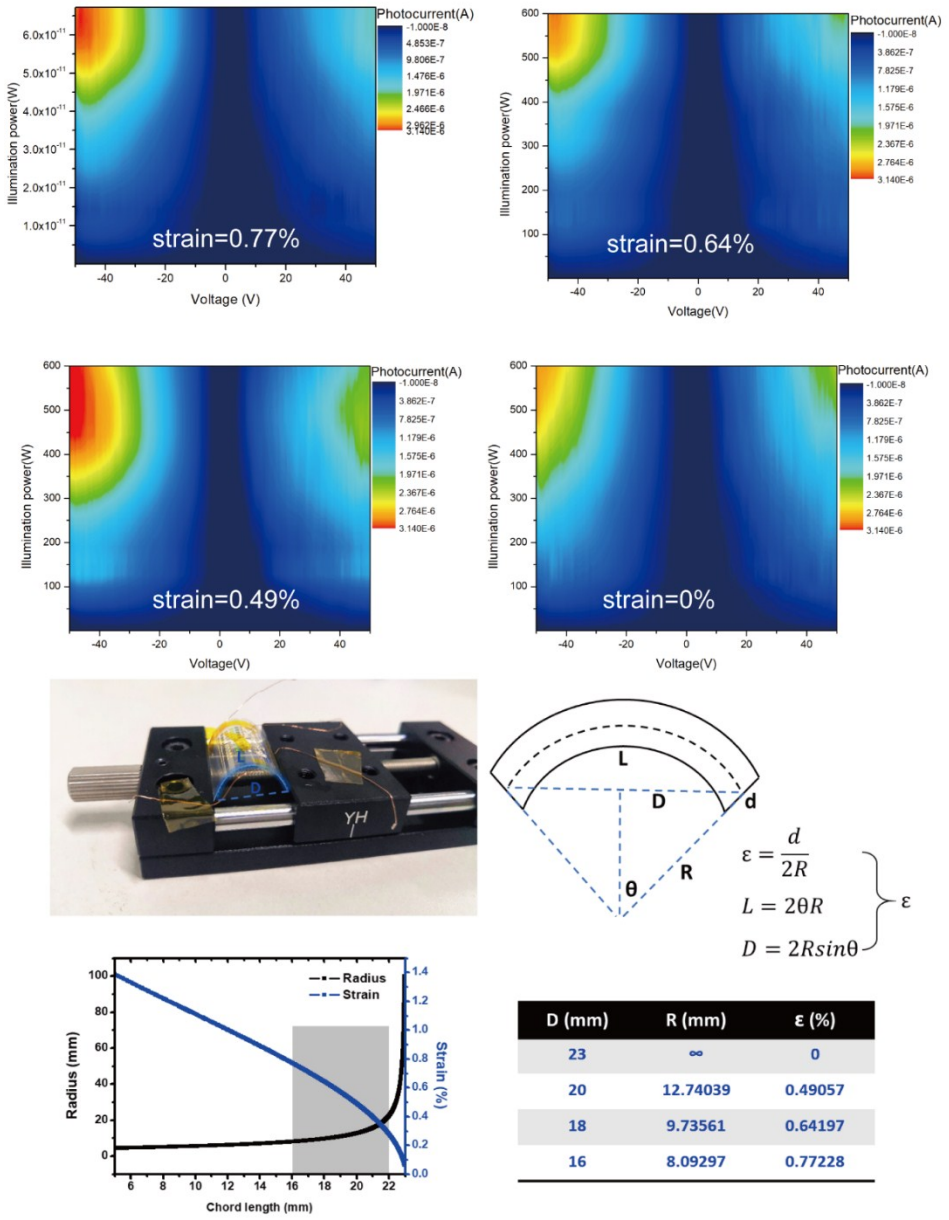


Figure S2 HRTEM and FFT conducted at different spots on the nanobelts. All the FFT show similar hexagonal patterns as in the SAED, indicating that most area of the nanobelt is single crystal.

S3. Photocurrent characteristics with various strain and the strain calculation method.



D (mm)	R (mm)	ε (%)
23	∞	0
20	12.74039	0.49057
18	9.73561	0.64197
16	8.09297	0.77228

Figure S3 Photocurrent characteristics shows little difference with various tensile strain. The flexible device was bent with a clamp. The tensile strain can be acquired through the equations above, where ε is the strain, d is the substrate thickness, R is radius, D is chord length, L is arc length and θ is bending angle.

S4. FDTD simulation on Ga_2O_3 nanobelts with width ranging from 10 nm to 280 nm.

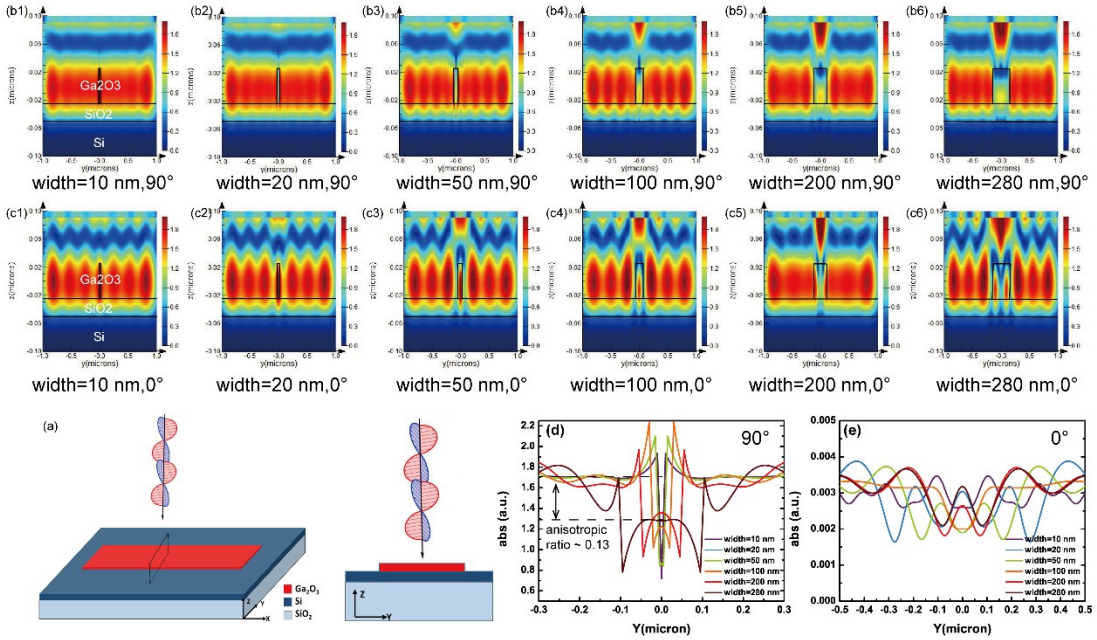


Figure S4 (a) Schematics of the FDTD simulation on Ga_2O_3 nanobelts on Si/SiO_2 substrate. (Similar anisotropic response is found in devices on Si/SiO_2 substrate, so the simulation result on Si/SiO_2 substrate also applies to device on PEN substrate.) (b1)–(b6) Simulation of photoelectric field with nanobelt width from 10 nm to 280 nm, radiated by 254 nm 90° polarized light (E//Y axis). (c1)–(c6) Simulation of photoelectric field with nanobelt width from 10 nm to 280 nm, radiated by 254 nm 0° polarized light (E//X axis). (d) The absorpiton of 254 nm 90° polarized light (E//Y axis) within nanobelts of different width. It is obvious that the absorption was reduced more with narrower nanobelts. (e) The absorpiton of 254 nm 0° polarized light (E//X axis) within nanobelts of different width. The absorption shows no obvious change with the nanobelts width.

The simulation is performed with lumerical FDTD solutions software. The refractive index of Ga_2O_3 is set to be 2 at 254 mn (according to C.V. Ramana, Properties of sputter-deposited gallium oxide, in: Gallium Oxide, Elsevier, 2019: pp. 47–66. https://doi.org/10.1016/B978-0-12-814521-0.00003-8.).