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Supporting Information

Flexible high-performance ultraviolet photoconductor with zinc oxide nanorods and 8-hydroxyquinoline

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Experimental

Material Preparation: All of the materials used in this study were purchased from Aldrich and were used as received without further purification. The polyimide substrate was cleaned in solution of detergent and water. Then ultrasonic with deionized water, acetone and isopropanol. After that, the substrate was dried at 120^{o}C for 2h.

ZnO nanorods preparation: Zinc acetate (0.82 g) and 100 μL of water were added into a flask containing 50 mL of methanol. The solution was heated to 60 °C with magnetic stirring. Potassium hydroxide (0.5 g) was dissolved into 25 mL of methanol and dropped into the flask within 10 min. It takes 2 h and 15 min to obtain 6-nm-diameter nanospheres. To grow the nanorods, the solution is condensed to about 10 mL. After another 5 h, the upper fraction of the solution is removed. Methanol is added to the solution and stirred. The upper fraction of the solution is discarded. This process is repeated twice. Finally, 10 mL of chloroform and 200 μL of *n*-butylamine are used to disperse the nanorods.

Device Fabrication: The precursor ZnO solution was then made by dissolving the prepared ZnO nanorods in chloroform with a concentration of 10 mg/ml. ZnO film was obtained by spin-casting the ZnO solution (at 2000 rpm for 60 seconds) on flexible polyimide (PI) substrate and a subsequent soft-baking process (on a hot plate at 230 ° C for 5 h at N_2 atmosphere), followed by thermal deposition of two 50 nm-thick Al electrodes via a shadow mask (resulting in a channel width of 2000 μm and a channel length of 50 μm). 8HQ film was then spin-coated (at 2000 rpm for 60 seconds) in chloroform with a concentration of 5 mg/ml.

Characterization: All electrical characterizations were recorded with a Keithley 4200 and a Micromanipulator 6150 probe station at room temperature in air. The monochromatic light (produced by the spectrophotometer with a halogen–tungsten lamp) is from a Newport Oriel 200^{TM}, and the intensity is 10.6 μW/cm^2. Prior to the use of monochromatic light, the spectral response of the mono-silicon solar cell was measured and normalized to the NREL standards. The AFM images were acquired using a Veeco NanoScope IV AFM scanning probe microscope with a silicon cantilever in tapping mode. The device cross-sectional image was characterized by SEM (Hitachi S-4800). The film thickness was measured using an Ambios Technology XP-2 profilometer. UV-vis spectra were recorded using JASCO V-570 spectrophotometer. The phase identification was determined by using a Rifaku D/MAX-2004 XRD with Cu Kα radiation (λ=1.54178 Å) operating at 40 KV and 60 mA.

The carrier saturation mobilities in field effect transistors were calculated using the equation $I_{DS}=C_i\mu(W/2L)(V_{GS}-V_T)^2$, where I_{DS} is the drain current, C_i is the capacitance per unit area of the gate dielectric layer, W and L are the channel width and length, and V_{GS} and V_T are the gate voltage and threshold voltage.

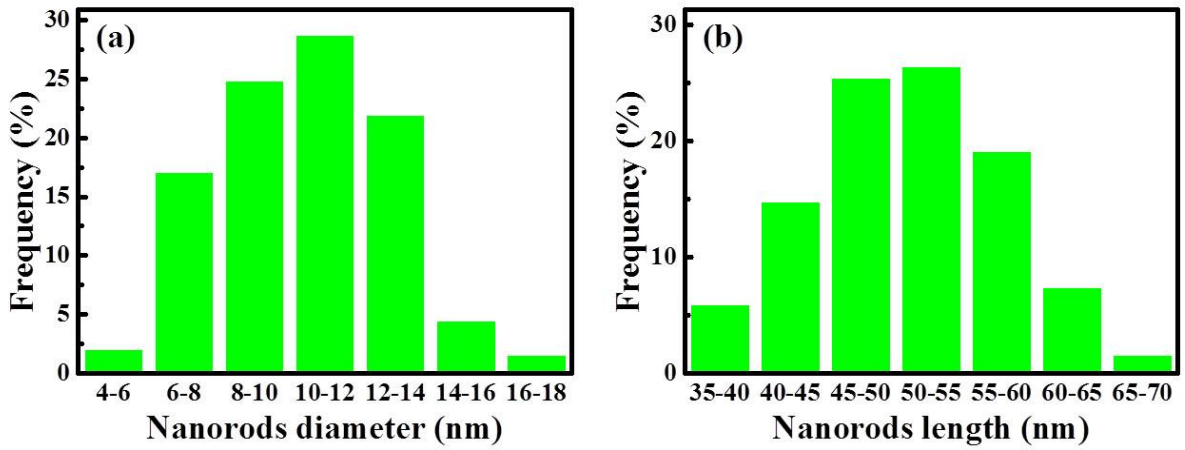

Figure S1. The histogram of (a) the diameter and (b) the length distribution of the ZnO nanorods.

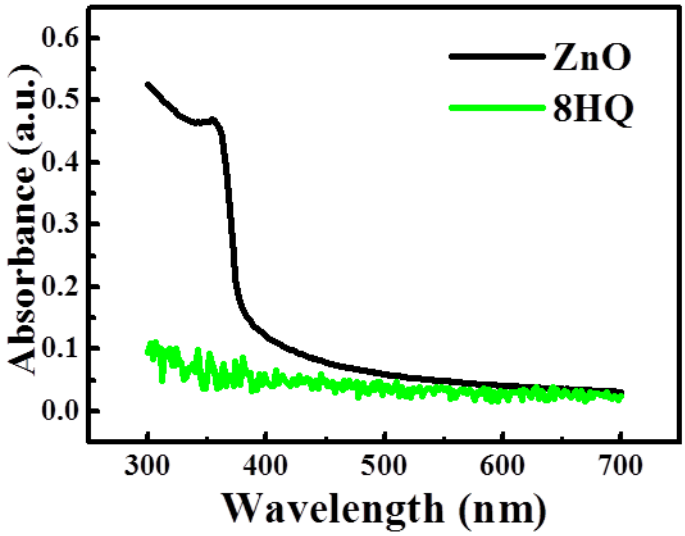

Figure S2. The absorption spectrums of the 8HQ film and the ZnO film after annealing.

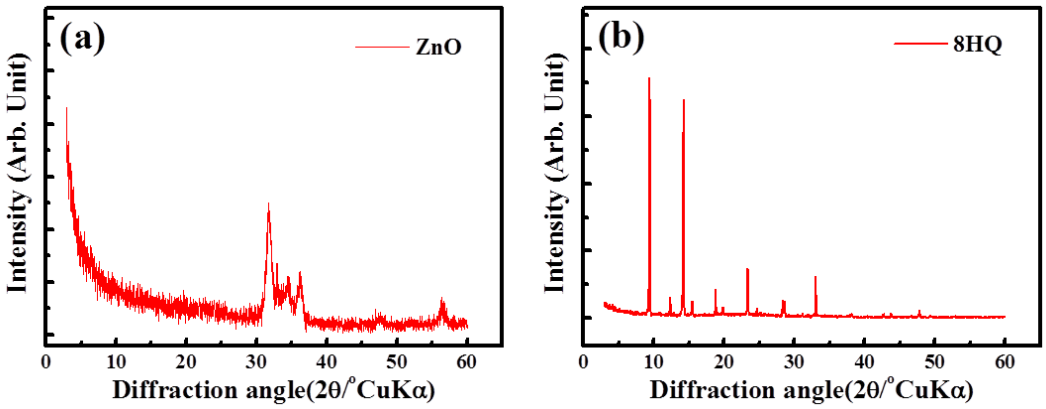

Figure S3. The XRD patterns of (a) the ZnO film after annealing and (b) the 8HQ film.