Electronic Supplementary Information

ZnOEP based phototransistor: Signal amplification and light-controlled switch

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Detailed Experimental procedure

Preparation and Characterization of ZnOEP nanorod. The agent of ZnOEP (98%) used in this work was purchased from Aldrich and was used without further purification.

The ZnOEP nanorods were deposited by PVD method. Briefly, ZnOEP powder loaded in a quartz boat was put into a quartz tube which was inserted into a horizontal tube furnace. Cooling water flowed inside the cover caps to achieve a reasonable temperature gradient in the tube. Nitrogen gas with a flow rate of 200 standard cubic centimeters per minute (200 Pa) was adopted during the process of vapor deposition to prevent ZnOEP from being oxidized. Various substrates for different measurements were put along the downstream side of the flowing nitrogen to collect the products. To prepare ZnOEP nanorods, the furnace was ramped to ca. 360 ˚C at a rate of 10 ˚C min^{-1}. Then after cooling down, the ZnOEP nanorods can be obtained.

The ZnOEP nanorods were characterized by Scanning Electron Microscopy (JEOL-6701), Fourier Transform Infrared (Bruker Tensor 27 FT-IR spectrometer, KBr pellet),

UV-vis absorption spectroscopy (SHIMADZU UV-1601) and X-ray diffraction (Rigaku D/max-2500 using filtered Cu Kα1 radiation).

Fabrication and Measurement of single ZnOEP nanorod based device. For the fabrication of single ZnOEP nanorod based device, ZnOEP nanorods were firstly dispersed into iso-octane, and then was transferred to a Si/SiO_2 (300 nm) substrate by drop casting. Au film was deposited by thermal evaporation on the single nanorod as electrodes by using copper grid (200 mesh) as a mask. Generally, the conducting channels were ranging from ca. 5 μm to 12 μm.

The two-probe method was applied to probe the photo effect on the electrical properties of the single ZnOEP nanorod based device. I-V curve was measured with a Keithley 4200 SCS and Micromanipulator 4060 probe station at room temperature in air. A white-light iodine-tungsten lamp with a power intensity ranging from 0.7 to 8.9 mW cm^{-2} was applied as illumination source.