Electronic Supplementary Material (ESI) for Analytical Methods.

Electrospun micro/nano fibrous mesh based nontoxic sensor for optical detection of high humidity

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Materials and instrument: All reagents were obtained commercially and used without further purification. Glycerol was purchased from Beijing Chemical Reagents Company. Poly (ethylene oxide) (PEO, 300 KDa) was purchased from Sigma-Aldrich and was used as received. Millipore Simplicity 185 purification unit purified water (18.2 MΩ cm) used for rinsing and preparing all solutions. Absorbance measurements were conducted on a Biotek Epoch plate reader at 400 nm. Scanning electron microscopy (SEM, Hitachi TM3030) was used to observe morphology of electrospun fibers at an acceleration voltage of 15 kV. All samples were dried under vacuum overnight and sputter coated with gold for 80 s before SEM imaging. Photo were obtained by Nikon D90 digital camera.

Electrospun fibers fabrication: PEO was dissolved in a mixed solvent of ethanol and chloroform with 3 to 1 volume ratio, after 10 hours stirring at room temperature, 4% w/v solution formed. The electrospinning was performed by a home-made electrospinning setup. The polymer solution was transferred to a 5 mL syringe connected to a 21G blunt needle, which was also the positive electrode. The polymer was dispensed using a syringe pump (LSP01-1A, Longer pump, Baoding, Hebei, China) at a constant flow rate of 1 mL per hour in a humidity controlled cubic chamber at room temperature. Humidity of the chamber was monitored by digital humidity and temperature thermometer and controlled under 20% relative humidity by N_2 gas. A stationary grounded aluminium foil collector was placed at a distance of 12 cm from the tip of the needle. Electrospinning of the polymer was carried out by

applying a positive voltage of 4 kV employing a high voltage supply (DW-P303, Tianjin Dongwen High Voltage Power Supply Co., Ltd, Tianjin, China) between the needle tip and the grounded collector. The electrospun PEO scaffold was kept overnight on a vacuum-dry oven in order to remove residual solvents. Then the PEO fibrous mesh was transferred to an optical clear adhesive film for further use.

Humidity measurement： Electrospun fiber mesh were cut into small pieces with a shape of 1 x 1 cm square. Different relative humidity were generated by mixing water and glycerol with different volume ratio according to previous report[1]. Relative humidity was confirmed by a digital humidity and temperature thermometer (Benetech GM1361). For a typical experiment, each piece of electrospun fiber mesh was covered on each well with different ratio of glycerol and water mixture, respectively, in a 96 well plate. After certain incubation time, absorbance of resulted fiber mesh were recorded. Photo images were obtained by placed fiber mesh piece on a red colour paper or red cutting broad to enhance the contrast.

Reference：

1 H. W. Yu, H. K. Kim, T. Kim, K. M. Bae, S. M. Seo, J. M. Kim, T. J. Kang, and Y. H. Kim, *ACS Appl. Mater. Interfaces* 2014, **6**, 8320