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Hierarchical Graphene-Polyaniline Nanocomposite Films for High-Performance Flexible Electronic Gas Sensors

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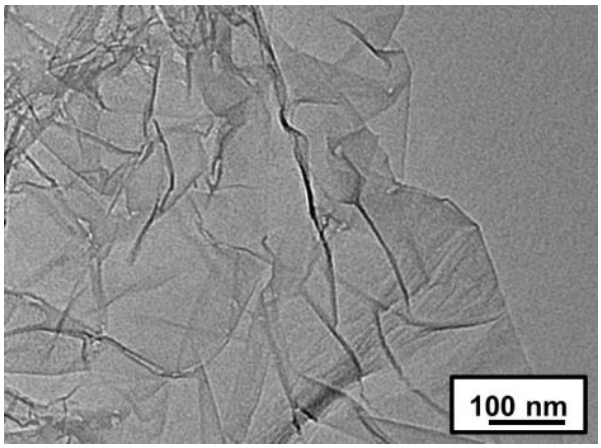

Fig. S1 TEM image of GO.

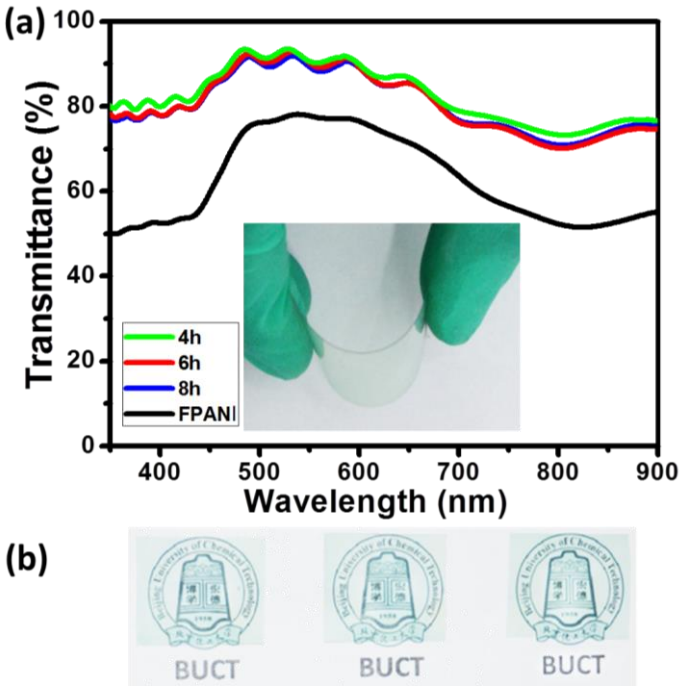

Fig. S2 (a) Transmittance spectra of hierarchically nanostructured PPANI/rGO-FPANI network films with different reaction time at 4 h, 6 h, and 8 h, and the FPANI film with reaction time at 6 h, respectively. Inset: the flexible transparent PPANI/rGO-FPANI network film (6 h sample). (b) Photographs of the hierarchically nanostructured PPANI/rGO-FPANI network films with different reaction time at 4 h, 6 h, and 8 h (from left to right). The school badges are placed behind the films.

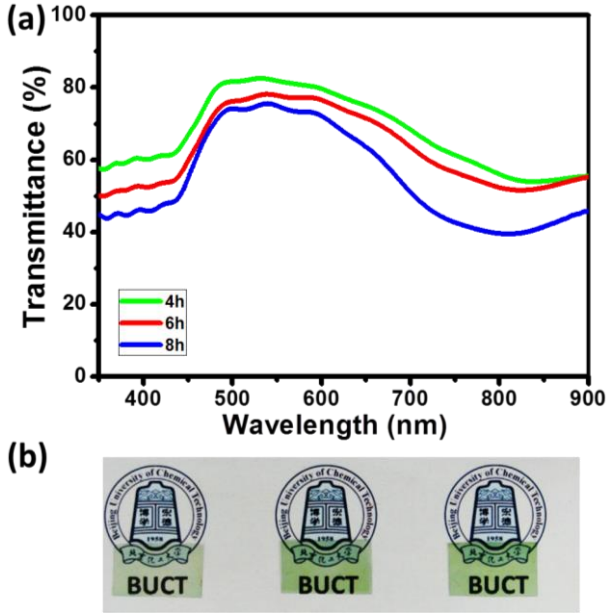

Fig. S3 (a) Transmittance spectra of the FPANI films with different reaction time at 4 h, 6 h and 8 h, respectively. (b) Photographs of the FPANI films with different reaction time at 4 h, 6 h and 8 h (from left to right). The words ‘‘BUCT’’ are placed behind the films.

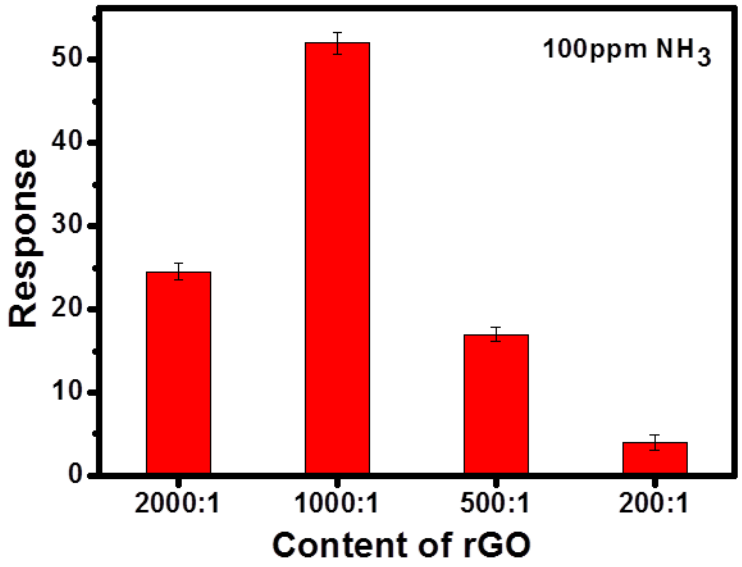

Fig. S4 The influence of rGO content on the sensing properties (the weight feed ratio of aniline to rGO at 2000:1, 1000:1, 500:1, 200:1 at 6 h polymerization).

The influence of rGO content on the sensing properties (the weight feed ratio of aniline to rGO at 2000:1, 1000:1, 500:1, 200:1 at 6 h polymerization) was studied, as shown in Fig. S4. When the weight feed ratio of aniline to rGO at 2000:1, there are excessive FPANIs to form the covered dense films and less PPANI/rGO composite for limited adsorption/desorption of NH_3, resulting in the lower response. While the weight feed ratio at 500:1 and 200:1, there are excessive PPANI/rGO composite connected by few FPANI with the less effectively exposed active surfaces of the sensing materials and less interconnected network, which restricts the charge transport and collection.

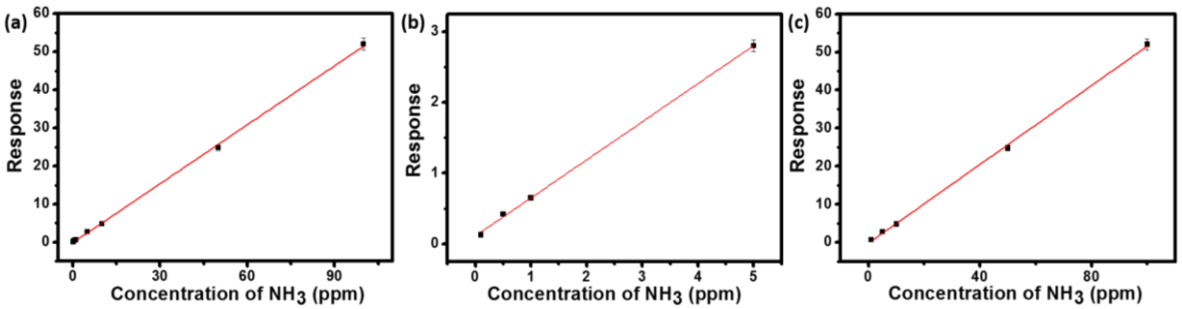

Fig. S5 (a) The variation of sensor response of the PPANI/rGO-FPANI network film as a function of NH_3 gas concentrations from 100ppb to 100ppm. (b) The detailed variation of sensor response for (a) with the NH_3 concentrations from 100 ppb to 5000 ppb. (c) The detailed variation of sensor response for (a) with the NH_3 concentrations from 1 ppm to 100 ppm.

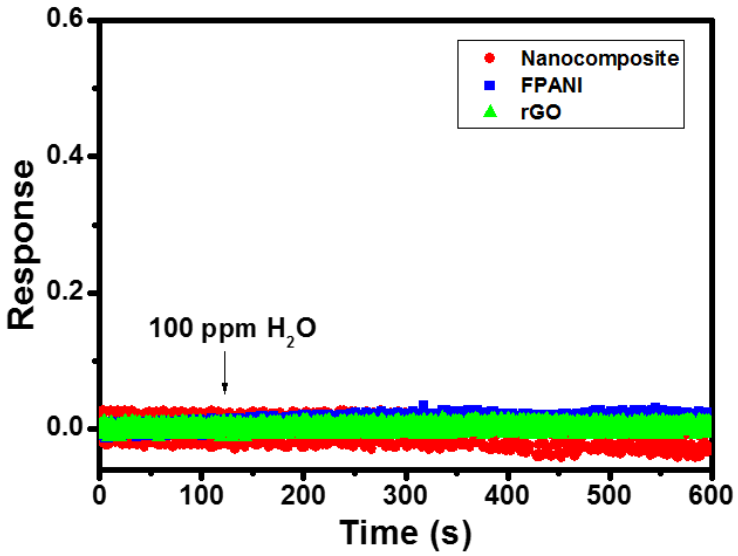

Fig. S6 No obvious response observed for 100 ppm H_2O in our experiment. In our experiment, the operating humidity range is 28-47%.

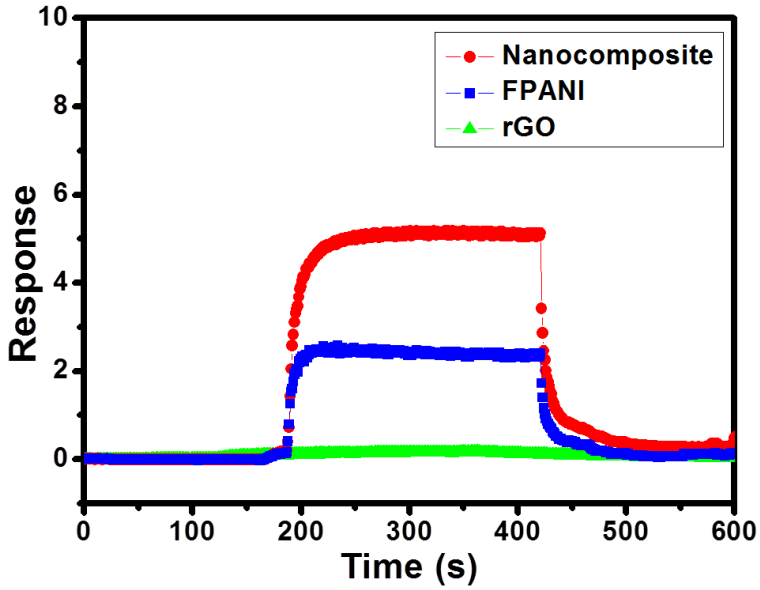

Fig. S7 The field test for the rGO, the FPANI, and PPANI/rGO-FPANI nanocomposite network film sensors (6 h sample), respectively, to a mixture of ammonia with ethanol, dichloromethane and acetone in 10 ppm.