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Supplementary Information

A new approach to flexible humidity sensors using graphene quantum dots

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Additional Experimental measurements

XRD and Raman characterization of the GQDs

X-ray diffractometer (XRD, PhilipsX'pert instrument with CuKα radiation (λ=1.54178 Å)) and a Raman spectroscope (SENTERRA scanning confocal Raman system with laser excitation of 758 nm) were utilized for characterization of the GQDs. The XRD diagrams of the GQDs and graphene oxide (GO) are depicted in Fig. S1.

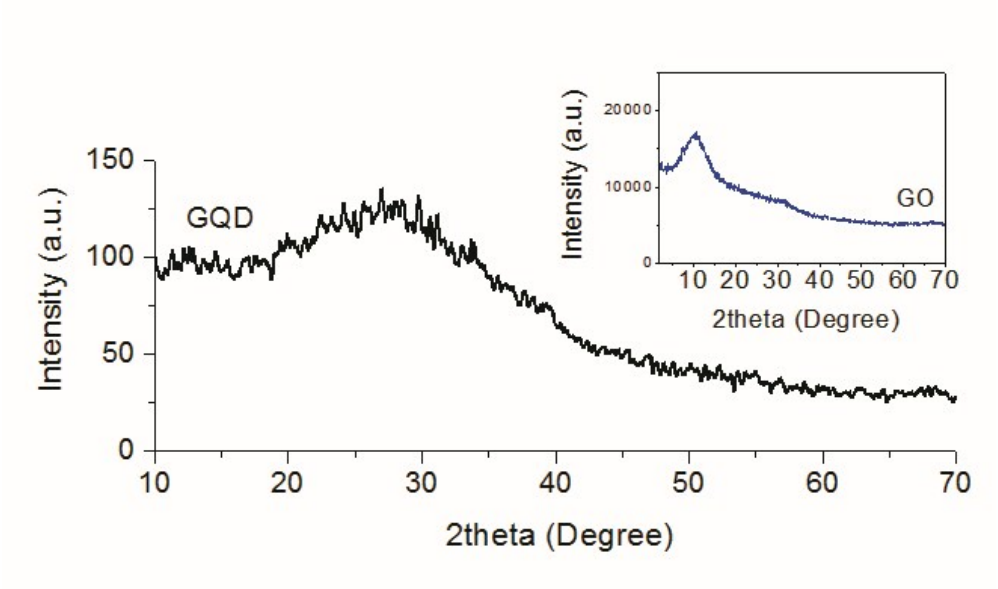

Fig. S1 XRD diagram of the GQDs. Inset shows XRD diagram for the GO.

For the GQDs, a broad prominent peak at $2\theta = 26.5^{o}$ is attributed to a 3.36 Å spacing which is much smaller than that of the GO (8.34 Å) as the initial material. This decrease in the interlayer distance confirms the reduction of GO sheets during the synthesis process. The broadness of the XRD peak shows that the GQDs are of poor crystallinity due to many edges and defects [S1].

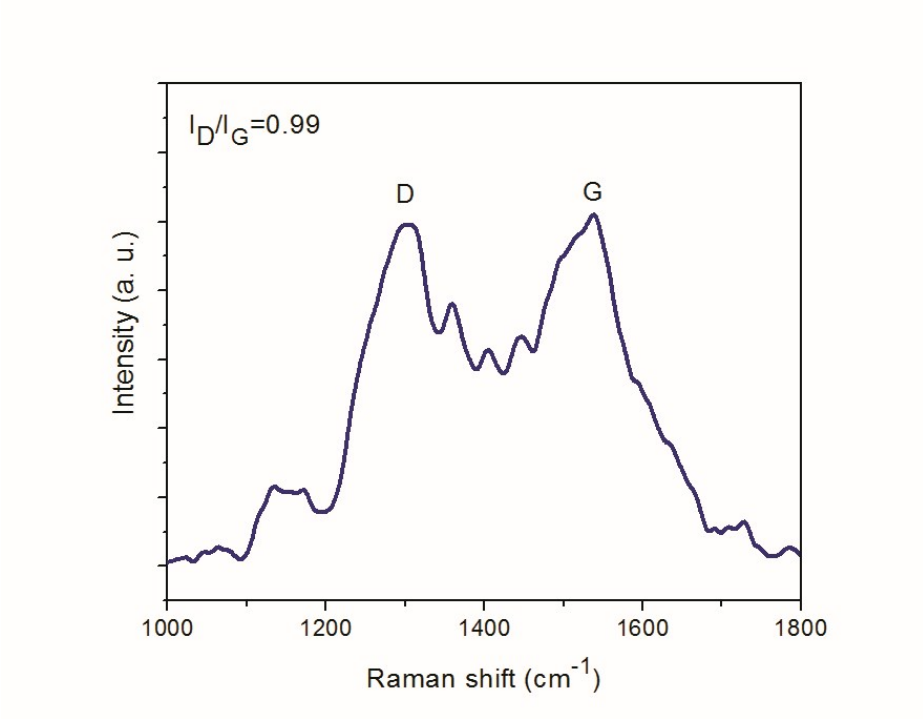

Fig. S2 Raman spectrum of the GQDs.

Fig. S2 shows a Raman spectrum of the samples. The extent of the defects is estimated by the relative intensity of the D-band to the G-band (I_D/I_G) [S2, S3]. Significant value of I_D/I_G, ~ 0.99, [S4] is indicative of defective structures and the presence of many edges confirming formation of GQDs [S5] which is consistent with UV-Vis, PL, and XRD results.

The thickness of the graphene quantum dot film prepared by drop casting for 10 times is about 5 μm. We fabricated samples with different number of drop casting ranging from 2

to 18. The thickness of the films was estimated through SEM cross section images roughly (typical SEM image has been presented in the following Fig. S3).

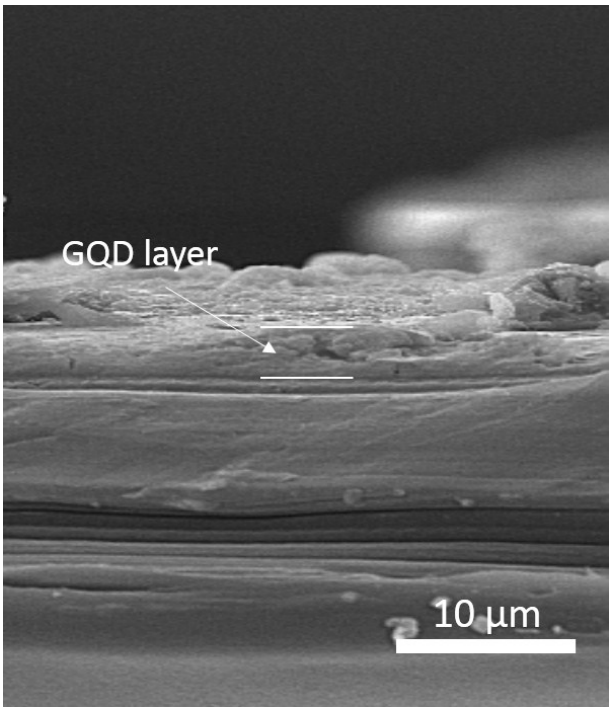

Fig. S3 Typical cross section SEM image of the GQDs layer drop casted for 6 times on the Kapton substrate.

References:

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