

## Supplementary information

### Colorimetric sensing of imidacloprid in cucumber fruits using a graphene quantum dot/Au (III) chemosensor

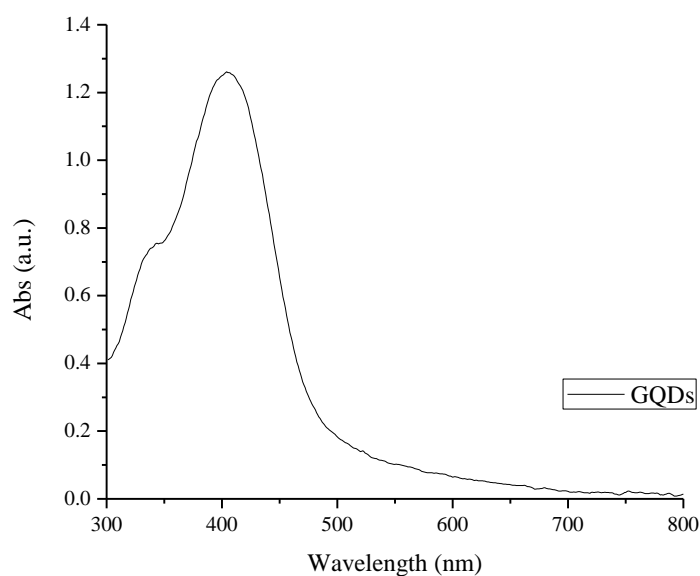
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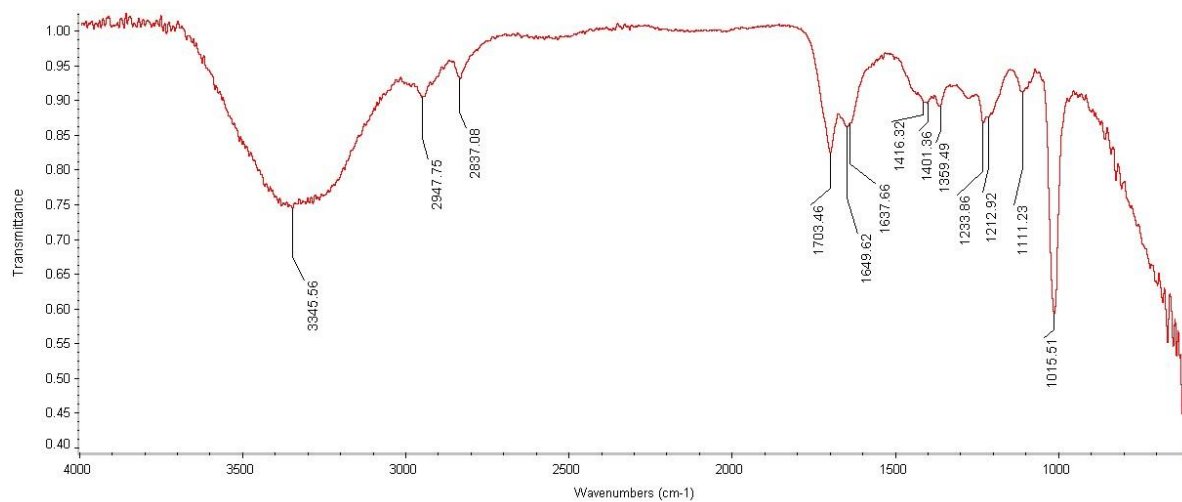
<sup>2</sup>Department of Nanochemistry, Nanotechnology Research Center, Urmia University, Shahid Beheshti St., Urmia, Iran.

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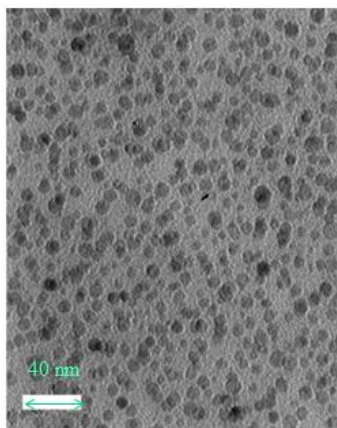
\*email: [p.ahmadi@urmia.ac.ir](mailto:p.ahmadi@urmia.ac.ir); [s.keshipour@urmia.ac.ir](mailto:s.keshipour@urmia.ac.ir)



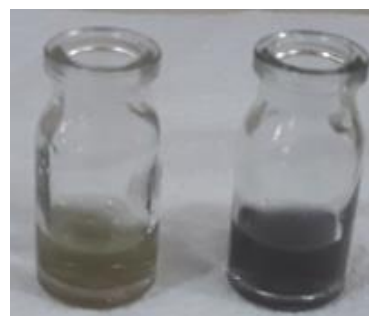
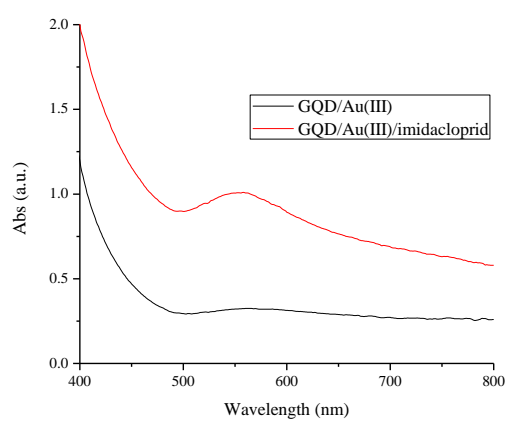
**Supplementary Figure S1.** The UV-Vis absorption spectrum of GQDs.



**Supplementary Figure S2.** FT-IR spectrum of GQDs.



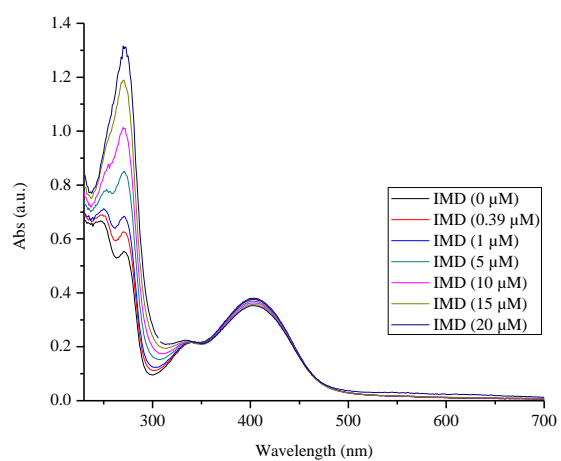
**Supplementary Figure S3.** TEM image of GQDs (the scale bar is 40 nm).



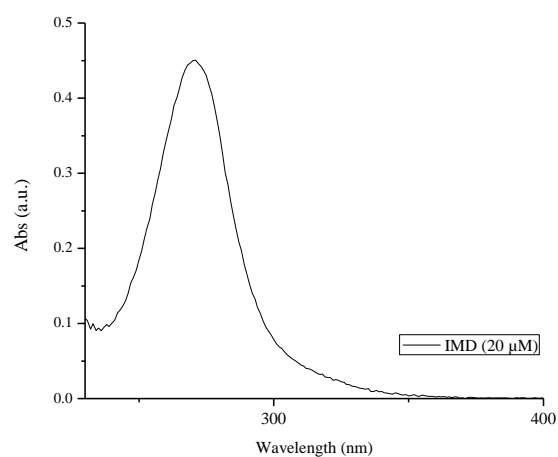
**(a)**

**(b)**

**Supplementary Figure S4.** UV-Vis spectrum **(a)** and the image **(b)** of GQD/Au (III) in the absence (grey) and presence (reddish grey) of imidacloprid after half an hour.

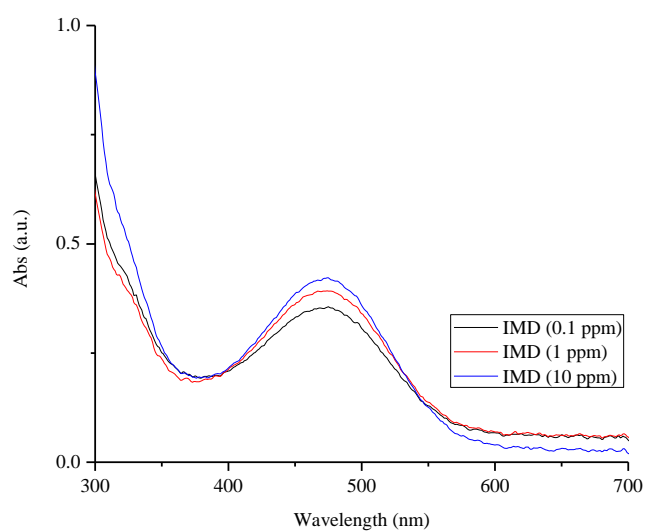


(a)

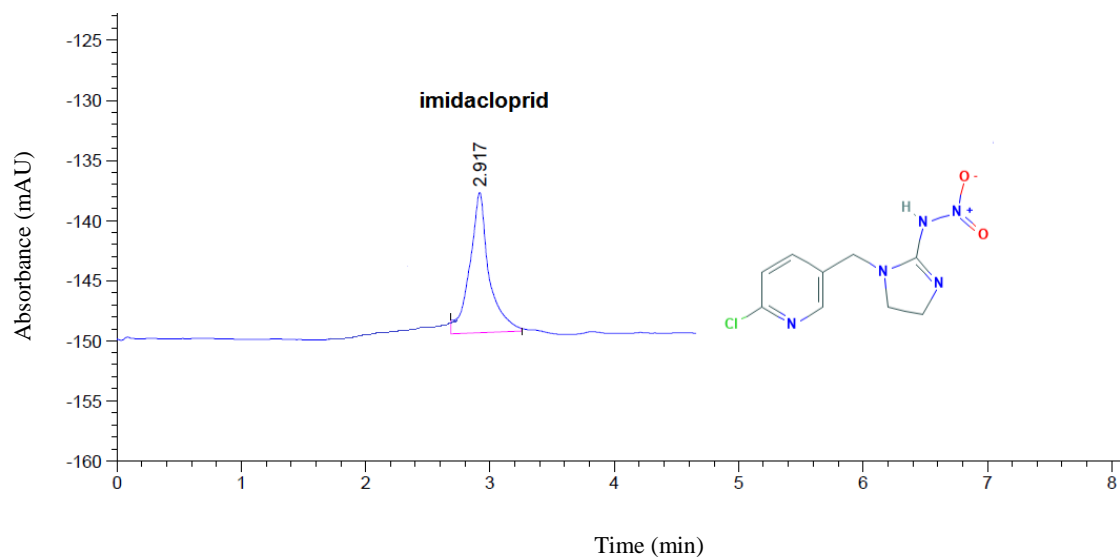


(b)

**Supplementary Figure S5.** (a) The UV-Vis absorbance spectra of GQDs in the presence of imidacloprid (0-20  $\mu\text{M}$ ) and (b) the absorbance of imidacloprid (IMD) at the concentration of 20  $\mu\text{M}$ .



**Supplementary Figure S6.** The UV-Vis spectra of Au (III) solutions with the addition of three concentrations of imidacloprid (0.1, 1, and 10 ppm).



**Supplementary Figure S7.** The chemical structure and chromatogram of imidacloprid.

Concentration of imidacloprid (ppm)	0.001	0.01	0.1	0.3	0.5	1	2	3	10	100	1000
$\lambda_{\max}$ (nm)	533	534	534	533	532	534	536	538	540	567	-

**Supplementary Table S1.** The maximum absorbance wavelength ( $\lambda_{\max}$ ) in various concentrations of imidacloprid.

Sample number	Harvesting time (day)	Imidacloprid (mg/kg)
29	1	1.11
33	2	0.68
37	4	0.30
41	8	0.21
45	15	0.17
49	21	0.14
53	25	0.07

**Supplementary Table S2.** The mean values of imidacloprid residues detected in cucumber samples by HPLC-DAD.