Supplementary information

Photoluminescence quantum yield of carbon dots: Emission due to multiple centers versus excitonic emission

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S1. Additional high-resolution XPS spectra.

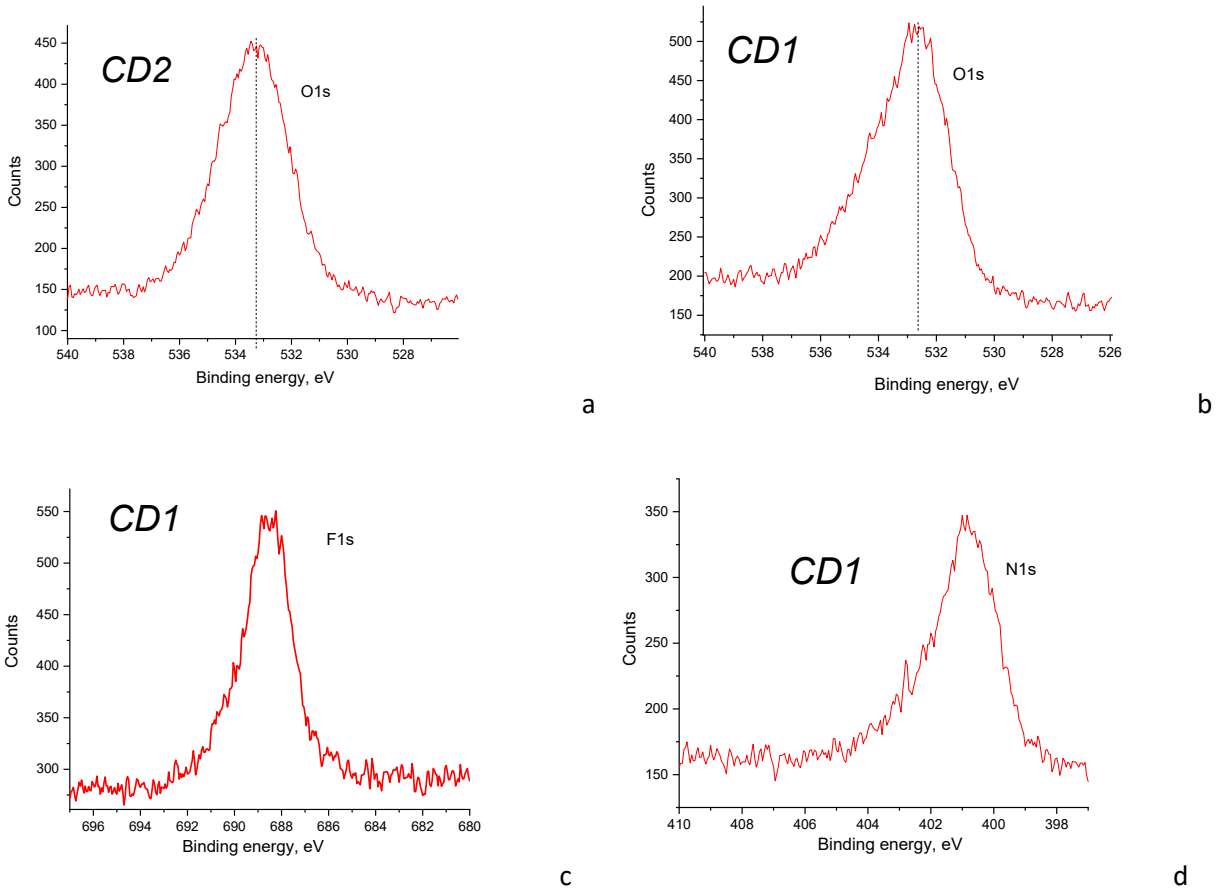
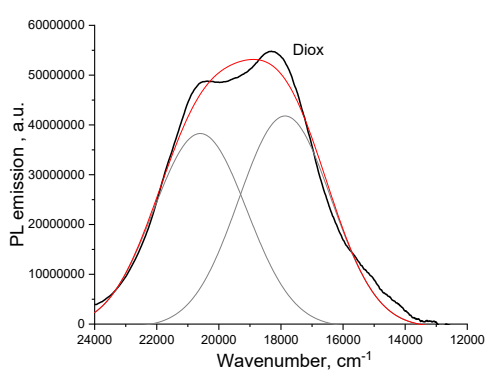
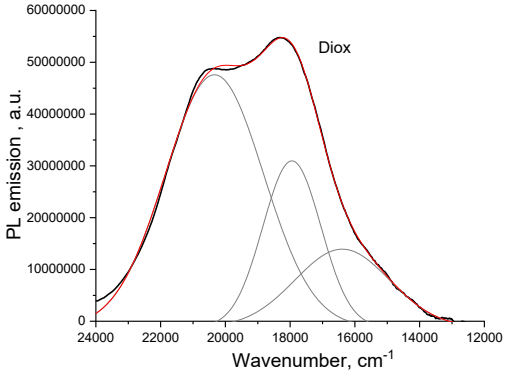


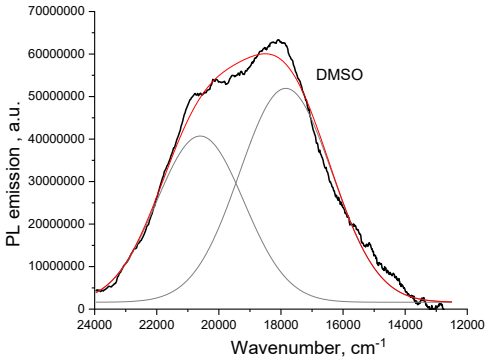
Fig. S1. High-resolution XPS spectra of indicated core levels in (a) CD1 and (b-d) CD2 samples.

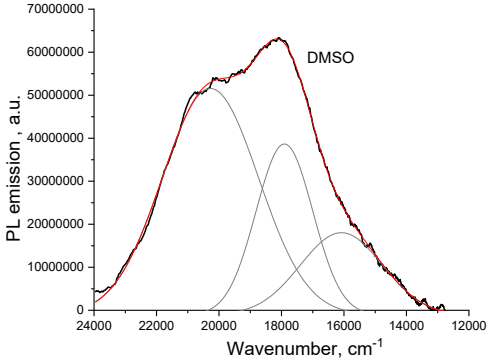
S2. Additional PL emission bands deconvoluted by Gaussians.



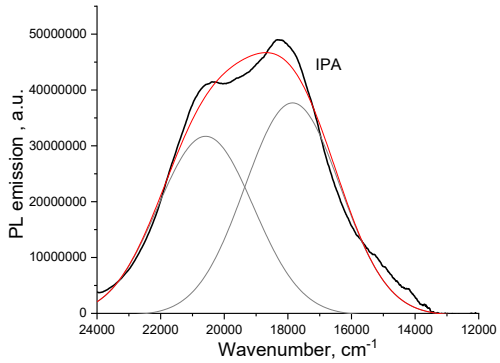


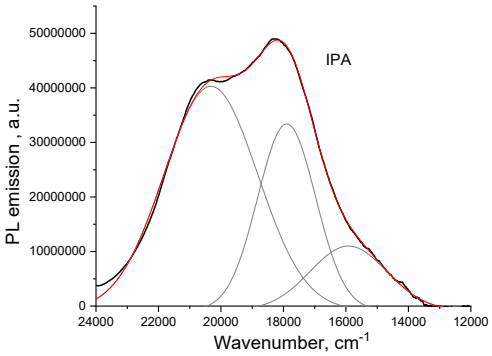
a





b





c

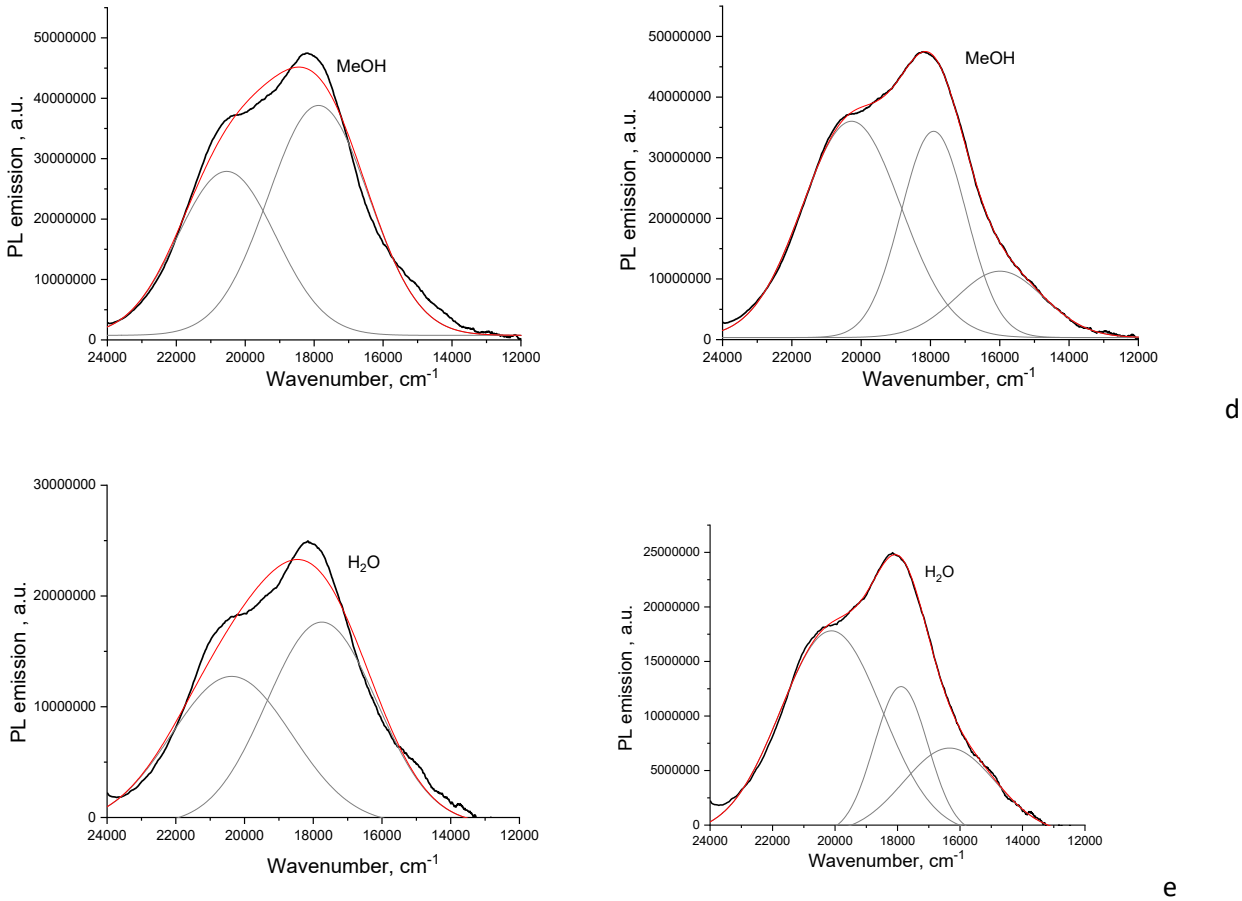


Fig. S2. Decomposition of the PL emission band of CD2 dispersions in (a) dioxane, (b) DMSO, (c) IPA, (d) methanol, and (e) water, into two (left column) and three (right column) Gaussians.

S3. Additional PL emission and PL excitation spectra of the samples.

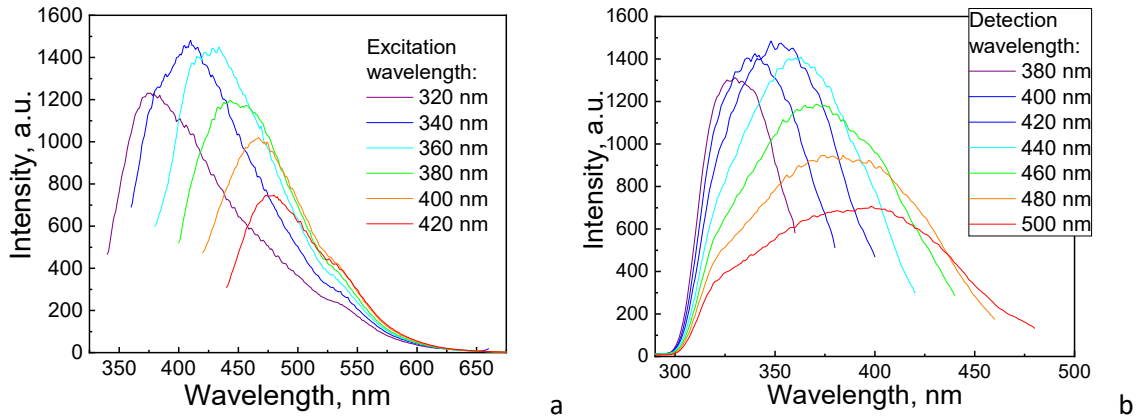


Fig. S3. (a) PL emission and (b) PL excitation spectra of CD2 in DMSO taken at indicated wavelengths.

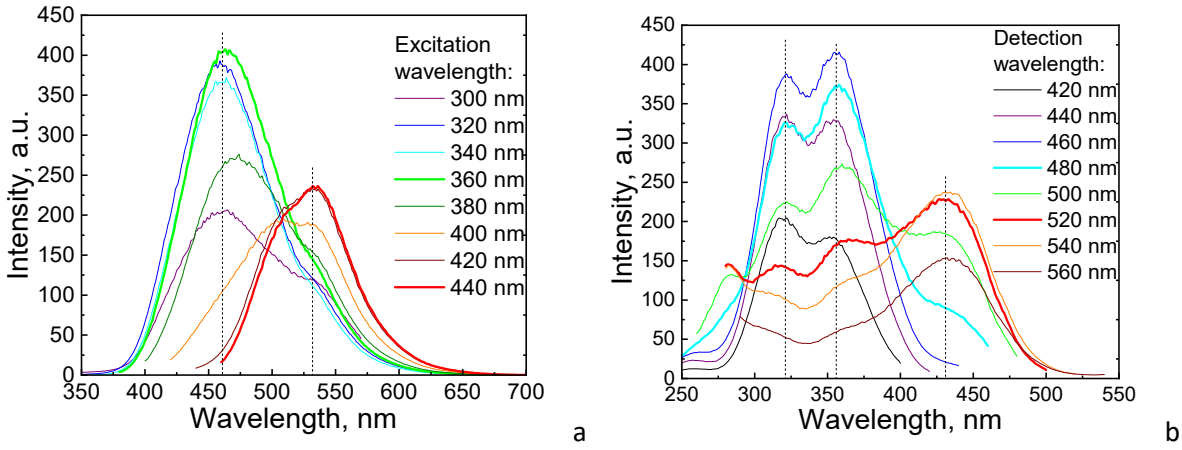


Fig. S4. (a) PL emission and (b) PL excitation spectra of CD1 in water taken at indicated wavelengths.

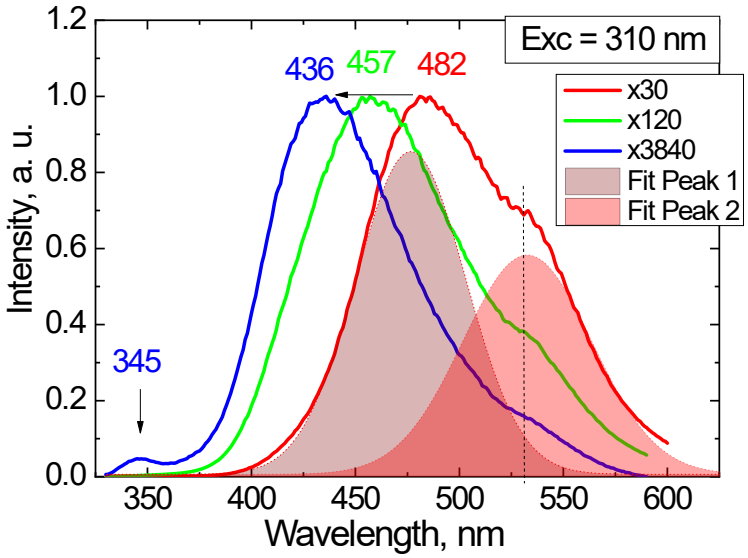


Fig. S5. Normalized PL emission spectra of CQ1 dispersions diluted by 30, 120, and 3840 times of the stock one. The peak at 345 nm is related to emission of some localized molecular-type chromophore with carboxyl end molecular groups [1], which becomes observable when the surface-to-volume ratio of increases when reducing the particle size.

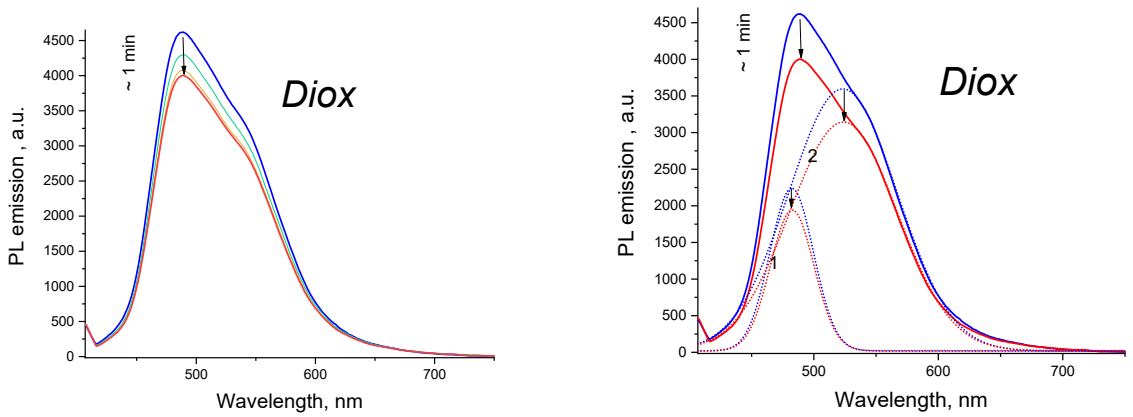


Fig. S6. (a) Evolution of the PL emission as a function of the sample excitation duration by CW laser (405 nm, 50 mW) during ~ 1 min. until “saturation” spectrum (red curve) was reached for dioxane solutions of CD1. The integration time of the each measurement was 50 ms. (b) The initial and “saturated” spectra in (a) presented with Gaussian decomposition.

S4. UPS spectra of the samples compared to that of the fullerene film.

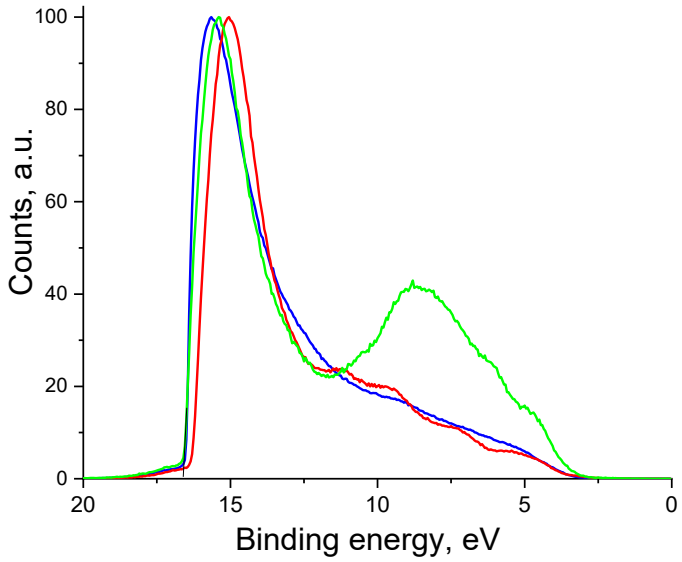


Fig. S7. UPS spectra of CD1 (red), CD2 (blue), and C60 (green) thin film samples.

Table S1. Energetic parameters of thin films derived from the UPS data.

	C60	CD1	CD2
Work function, eV	4.6	4.9	4.65
Ionization potential, eV	6.1	6.0	5.85
Electron affinity, eV	4.5	3.3	3.0

References

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[1] Sciortino, A., Cayuela, A., Soriano, M. L., Gelardi, F. M., Cannas, M., Valcárcel, M., & Messina, F. (2017). Different natures of surface electronic transitions of carbon nanoparticles. *Physical Chemistry Chemical Physics*, *19*(34), 22670-22677.