

**Investigation into Red Emission and its Applications: Solvatochromic N-Doped Red Emissive Carbon Dots with Solvent Polarity Sensing and Solid-State Fluorescent Nanocomposite Thin Films**

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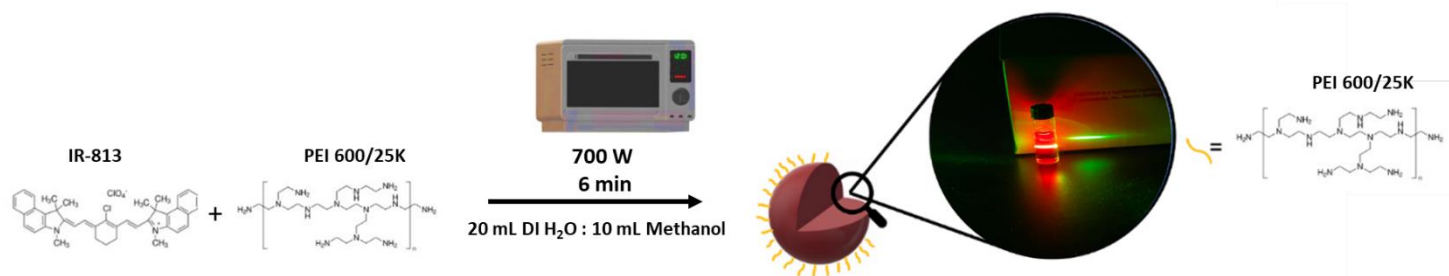
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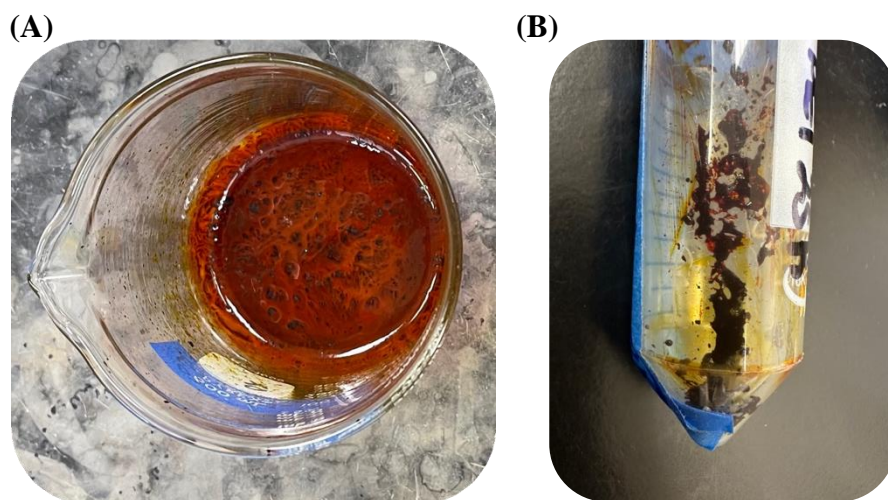
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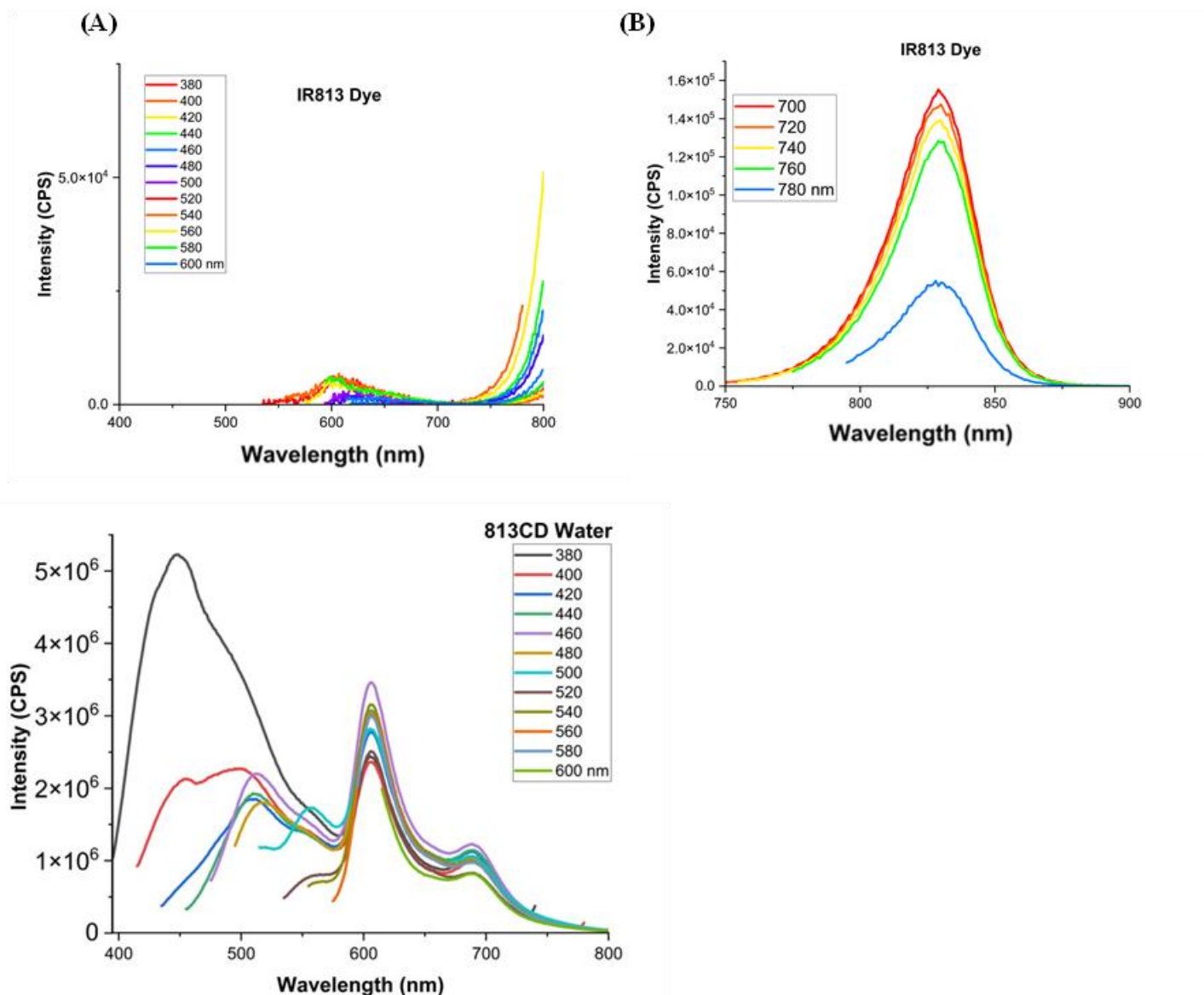
## Supporting Figures:



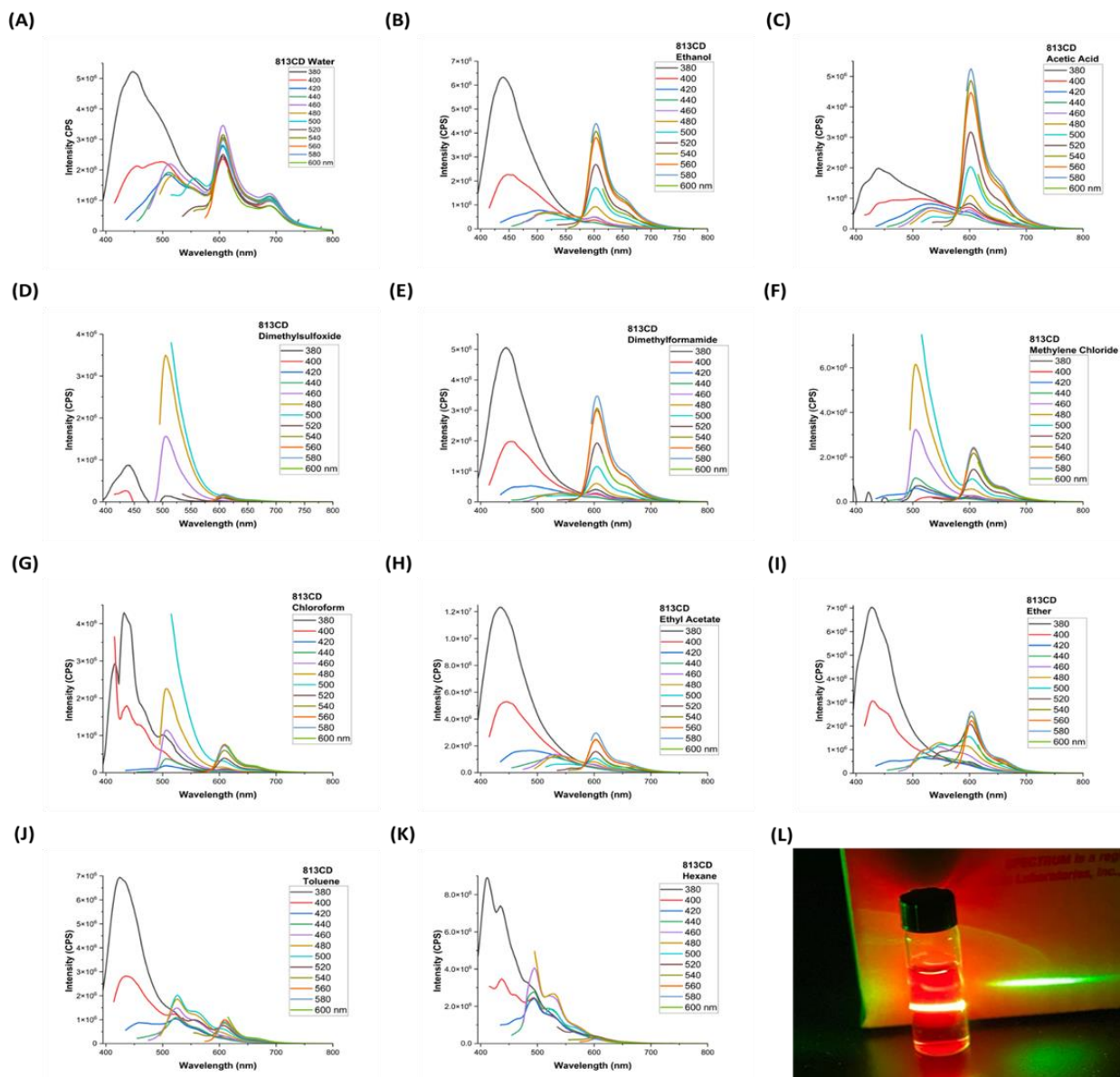
**Figure S1:** Graphic illustration of 813-CD synthetic procedure.



**Figure S2:** Images of 813-CDs post-synthesis and purification. (A) Image of 813-CD 600 PEI. (B) Image of 813-CD 25K PEI.

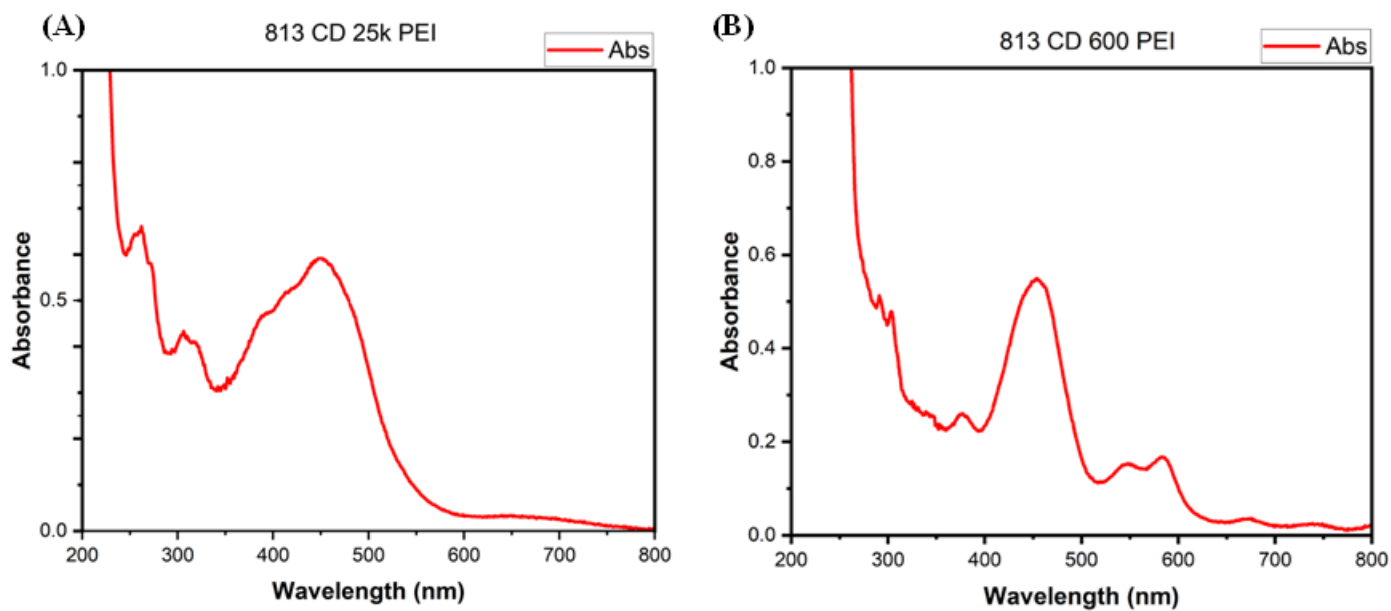


**Figure S3:** PL spectra of 813-CD versus IR-813. (A) PL spectrum of IR-813 from 400-800 nm in methanol. (B) PL spectrum of IR-813 from 750-900 nm in methanol. (C) PL spectrum of 813-CD from 400-800 nm in water.

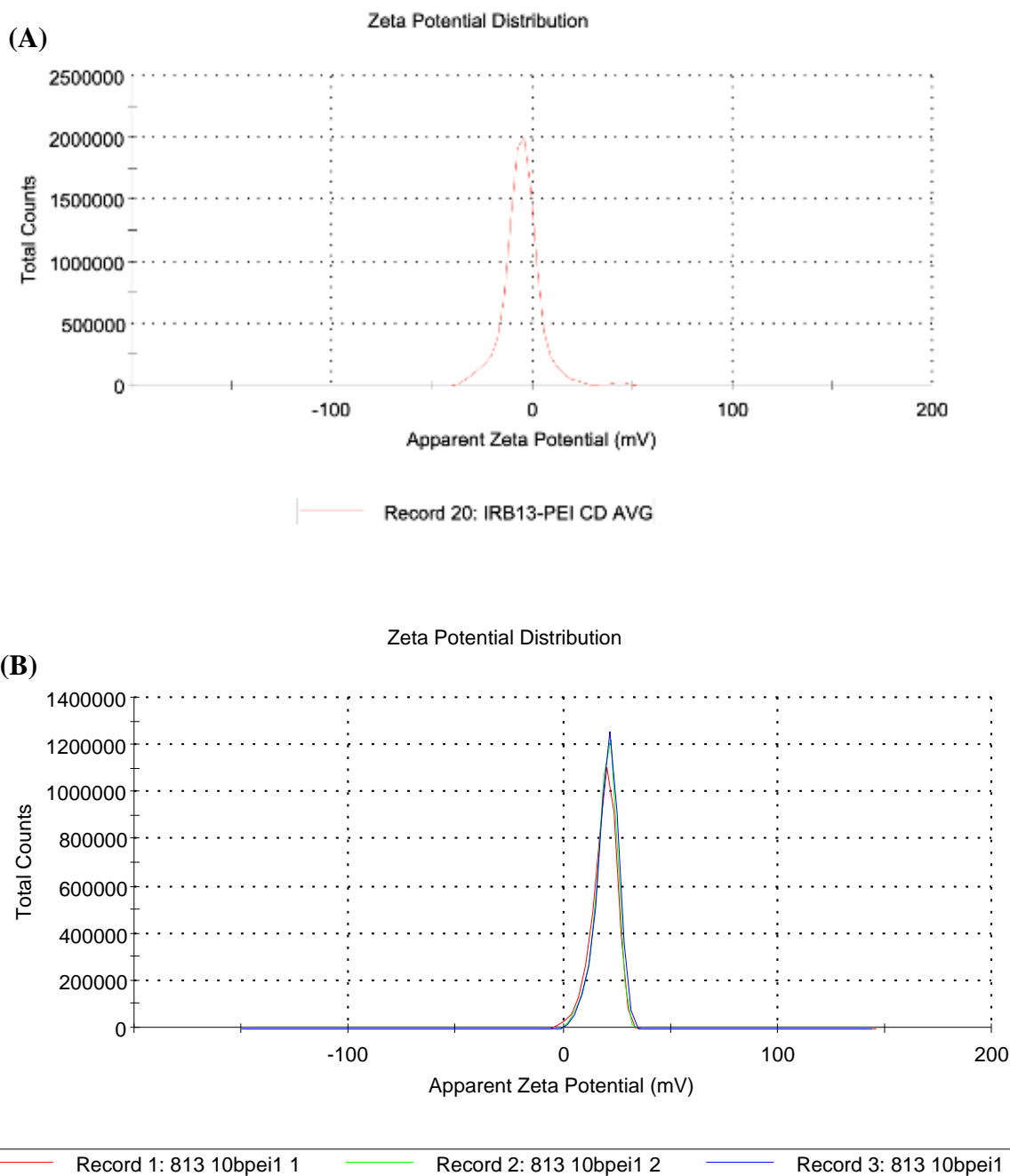


**Figure S4.** Optical analysis of 813-CDs in various solvents of decreasing polarities according to the solvent polarity index ( $P$ ), PL spectrum. (A) water  $P:1.00$ , (B) ethanol  $P:0.654$ , (C) acetic acid  $P:0.648$ , (D) DMSO  $P:0.444$ , (E) DMF  $P:0.386$ , (F) methylene chloride  $P:0.309$ , (G) chloroform  $P:0.259$ , (H) ethyl acetate  $P:0.228$ , (I) ether  $P:0.117$ , (J) toluene  $P:0.099$ , and (K) hexane  $P:0.009$ , respectively.; (L) 813-CDs in water under excitation at 535 nm.

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**Figure S5:** UV-vis absorbance spectra of 813-CDs in water. (A) UV-vis spectrum of 813-CD 25K PEI from 200-800 nm. (B) UV-vis spectrum of 813-CD 600 PEI from 200-800 nm.



**Figure S6:** Zeta potential of 813-CDs. (A) Zeta potential of 813-CD 600 PEI, -5.11 mV. (B) Zeta potential of 813-CD 25K PEI, +18.8 mV

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Summary Chart of 813-CDs							
CD	Dye	Polymer	Microwave (Watts)	Time (s)	Size (nm)	Farthest PL (nm)	Application
813CD-600 PEI	IR-813	PEI- 600	700	360	6.0-6.5	698	PVP Film Composite
813CD-25K PEI	IR-813	PEI- 25 K	700	360	2.0-3.5	776	Positively Charged Surface

110 **Table S1.** Summary of CD methodology and properties.