Electronic Supplementary Information

Colour tuneable hydrophobic carbon dot aggregates for LEDs applications

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Materials and Physical Methods:

Methanol was purchased from Advent Chembio Pvt. Ltd, Navi Mumbai, India. 2,2'-dithiosalicylic acid (DTSA) was purchased from Sigma-Aldrich, Mumbai (India). Adenine and Acetic were procured from Sisco Research Laboratories Pvt. Ltd. Mumbai Maharashtra, India, whereas, 4-Aminobenzenethiol purchased from TCI Pvt. Ltd. Concentrated H_2SO_4, DMSO, and Ethanol were obtained from Qualikems Fine Chem Pvt. Ltd., Vadodara (India). All the reagents were used as received without further purification.

FT-IR data were acquired using spectrum two PerkinElmer ATR FT-IR spectrometer. UV-vis study was done on UV2600 Schimazdu spectrophotometer. PXRD data was obtained from Empyrean Malvern Panalytical instrument (Cu-Kα radiation) between angle 2θ = 3-80°. Photoluminescence spectra were obtained from perkinElmer fluorescence spectrometer (FL8500). FE-SEM images were procured using JEOL-7610 F Plus. The contact angle was measured from Kruss GmbH DSA-25E drop shape analyzer.

Synthesis and Characterization:

Synthesis of ODA

In the preparation of orange coloured fluorescent ODA aggregated carbon dot, 275mg (0.89 mmol) DTSA and 120mg (0.89 mmol) Adenine was dissolved in 20mL of acetic acid. The solution was sonicated for 20 minutes to obtain a clear solution followed by transferred mixture to the Teflon-lined autoclave. Further, it was heated at 180°C for 10 hours. The obtained liquid OA was cooled to room temperature and centrifuged at 10000 rpm for 20 minutes. The large particles were separated by filtration using a 0.22μm syringe filter. Upon addition of 200mL boiling DI water to the OA solution, the aggregated ODA was precipitated out. A pure ODA was obtained by filtration, washing with DI water followed by drying in a vacuum desiccator. FTIR (cm^{-1}): ν(C=O) 1676, 1666, ν(C–N) 1259 cm^{-1}, ν(C–O) 1034 cm^{-1}, ν(C–S) 695 cm^{-1}, ν(S–S) 550 cm^{-1}. UV-visible (Solid-state): 345, 450, 557 nm.

Synthesis of GDA

The green fluorescent GDA aggregated CD was synthesized by following the similar procedure adopted for ODA, except the *p*-amino benzene thiol 112 mg (0.89 mmol) was used instead of Adenine. FTIR (cm^{-1}): ν(NH/OH) 3300, ν(C=O) 1676, 1666, ν(C–N) 1259, ν(C–O) 1034, and ν(C–S) 695 cm^{-1}, ν(S–S) 550 cm^{-1}; UV-visible (Solid-state): 250 and 450 nm.

Preparation of LEDs: The freshly synthesized carbon dots 15mg powder was completely mixed with 10g epoxy resin. Further, the mixture was drop casted over the UV LED chip and left it for 1 hour at ambient room temperature to get proper mould. Furthermore, the prepared LEDs of 365 nm were illuminated by a power supply at 3.2V.

FE-SEM sample preparation:

A freshly prepared sample was drop casted on FTO glass substrate and dried under vacuum in desiccator for 4 days to obtain dried sample. Further, the gold coated sample was mounted to the scanning electron microscope for morphological analysis.

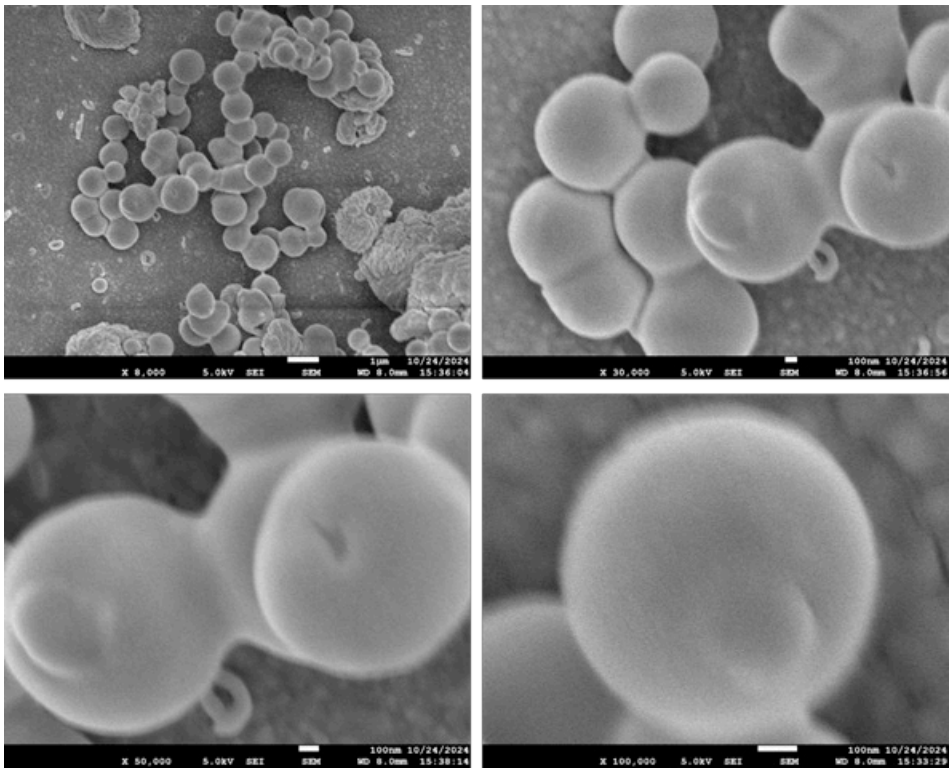

Figure S1: FESEM images of **ODA** at different magnification.

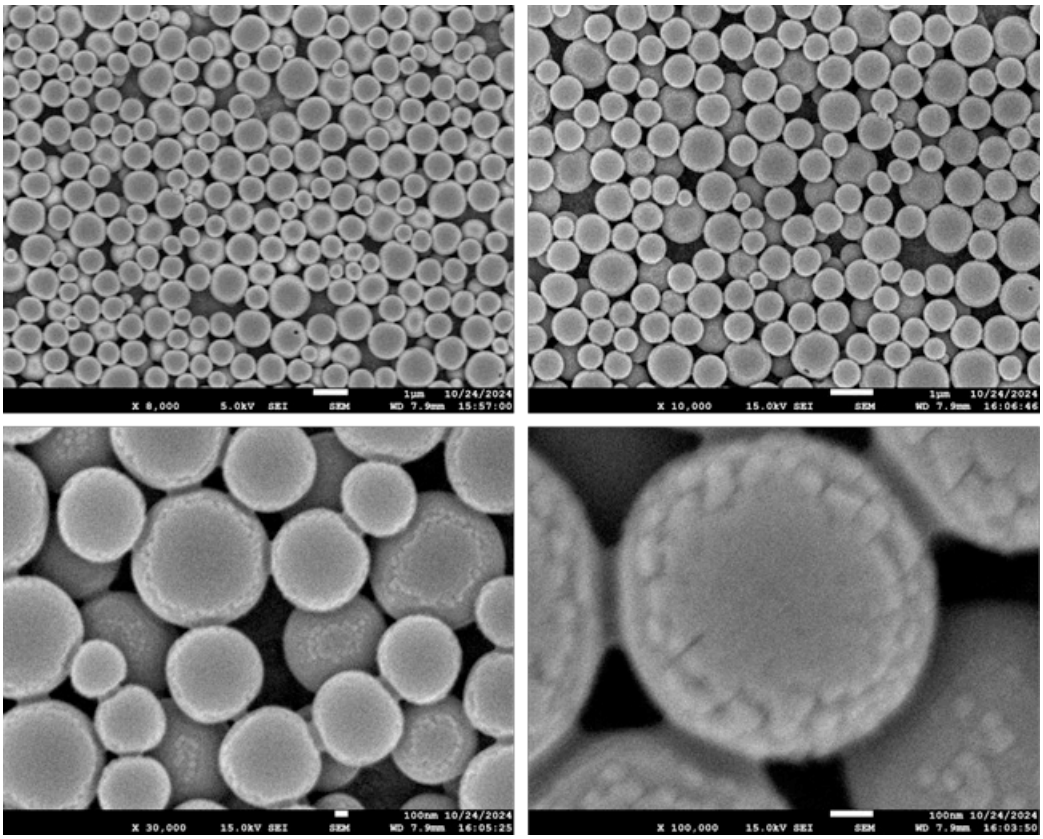

Figure S2: FESEM images of **GDA** at different magnification.

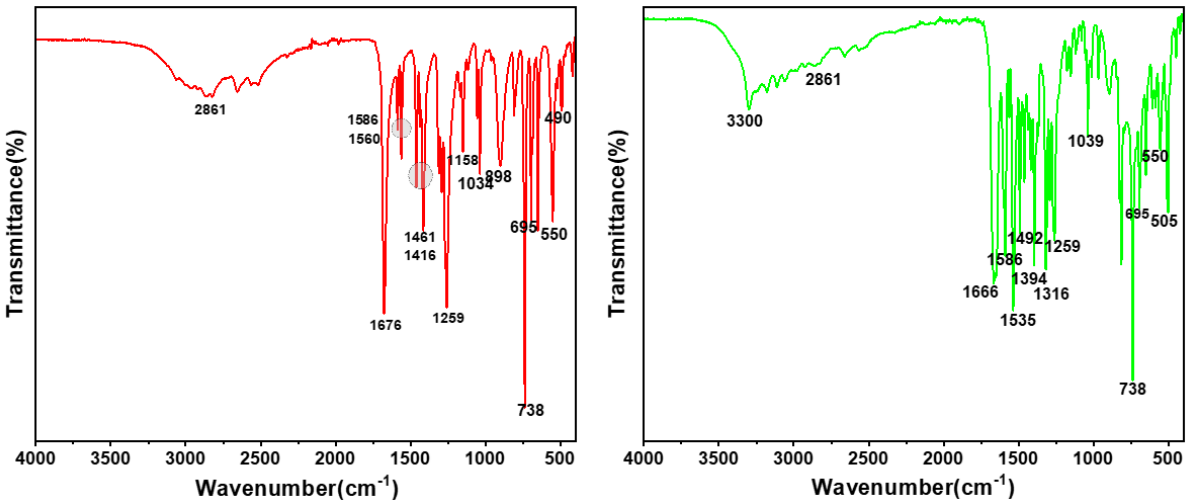

Figure S3: FTIR spectra of **ODA** (left) and **GDA** (right) aggregates.

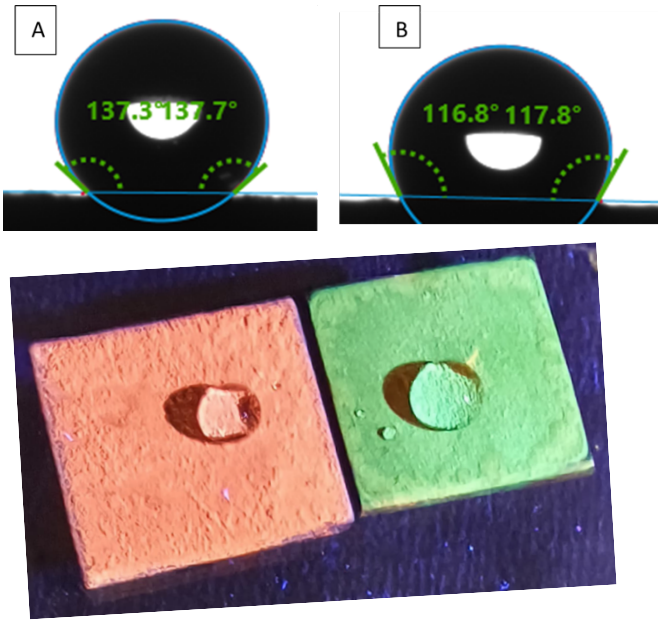

Figure S4: Contact angle (A) **ODA** and (B) **GDA** aggregates. Water droplet demonstrated over the **ODA** and **GDA** coated samples under UV light (λ_{ex}= 365 nm).

Note: For measuring the contact angle, the powder of **ODA** or **GDA** were mixed with PVDF in 1:1 and coated over the mild steel (2x2 cm^2) surface.

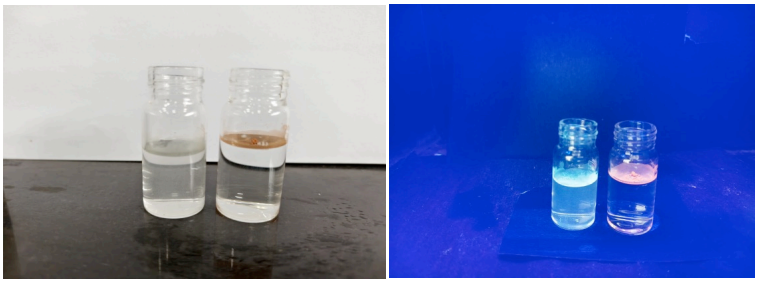

Figure S5: The demonstration of hydrophobicity of **ODA** and **GDA** aggregates in water under naked eye (left) and UV light (right) (365 nm).

Note: A brief sonication also could not solubilize or disperse the **ODA** and **GDA** in water. It appeared remain floated over water.