Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supplementary Section

Exploration of the impact of graphene oxide, acetylenic Gemini, and CTAT on the photophysical and aggregation properties of dipolar coumarin-153

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1. Synthesis of graphene oxide using modified Hummer's method:

A temperature-controllable magnetic stirrer was used to continuously stir a mixture of 1 gm of graphite flakes and 0.5 gm of $NaNO_3$ in a 250 mL round bottom flask while adding 25 mL of concentrated H_2SO_4. After two hours, the aforementioned solution was gradually supplemented with 3 g of KMnO4 while maintaining the temperature below 25^0C in an ice bath to prevent overheating and explosion. While the $KMnO_4$ was added, the mixture was continuously stirred. The addition of $KMnO_4$ resulted in the appearance of a greenish hue (Figure S1 (A)). Following the addition of $KMnO_4$, the mixture was vigorously agitated at 35°C for a whole night. The resulting solution, which had taken on the appearance of a mass and was coloured brown, was then placed into a 500 mL water beaker while being vigorously mixed. The suspension was then treated with a 10% solution of 30% H_2O_2 to guarantee that the reaction with the KMnO4 was completed. After adding H_2O_2, a pale-yellow glazy look (cf. Figure S1 (B)) emerged. The resulting combination was centrifuged and decanted of the supernatant liquid before the brown-black mass (Figure S1(C)) was taken and placed in a watch glass. The mixture was then washed with HCl and H_2O_2, respectively. Thus, graphene oxide sheets were produced after 4-5 days of drying at temperatures below 50°C. These sheets were broken up in a mortar before being sent through a molecular sieve. Finally, black GO power was attained.


A
B
C

Fig. S1: Synthetic steps of graphene oxide using modified Hummer's method.

2. Synthesis of N, N'- di hexadecyl - N, N, N', N'- tetramethyl-N, N'-but-2-ynediyl-di-ammonium chloride (16-4-16):

Di cationic Gemini surfactant was prepared as per the protocol reported by Menger et. al. [40]. N, N-Dimethyl hexadecyl amine (0.5 gm, 3.2 mmol) was transferred into a 250 mL round-bottomed flask and dissolved in 20 mL dry acetone. After dissolution, 0.3 gm (1.4 mmol) 1,4- dichloro-2-butylene was added dropwise to the solution taken in the round-bottomed flask at room temperature with constant stirring. After complete addition, the resultant solution was stirred at room temperature overnight. White solids appeared after the first 2 hours of stirring. After overnight stirring, the obtained white solid was filtered, washed with acetone, dried under a vacuum, and recrystallized with hot acetone (Yield: 75%, m.p.- 215^0 C (dec.)).

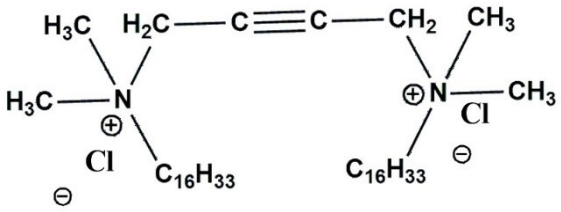

Fig. S2: Structure of synthesized cationic Gemini surfactant (16-4(2-yen)-16) (16 -4-16).

3. Characterisation of 16-4-16 surfactant:

^{1}H NMR:

^{1}H NMR: (300MHz, $CDCl_3$): δ5.17(s,4H), 3.63(t,4H), 3.43(s,12H), 1.75(m,4H), 1.34 1.05(m,52H), 0.85 (t, 6H)

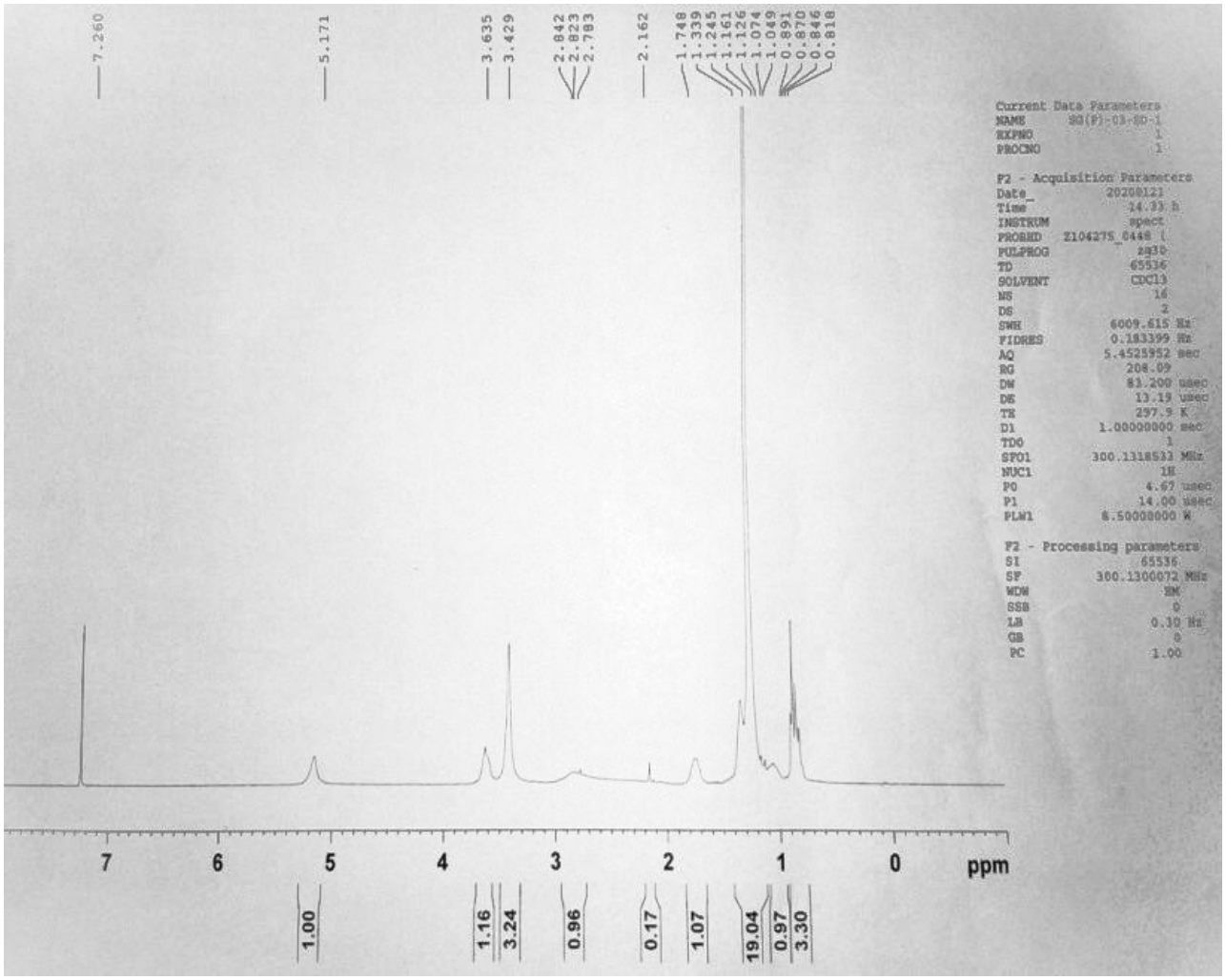

Fig. S3: ^{1}H NMR of synthesised 16-4-16 gemini surfactant

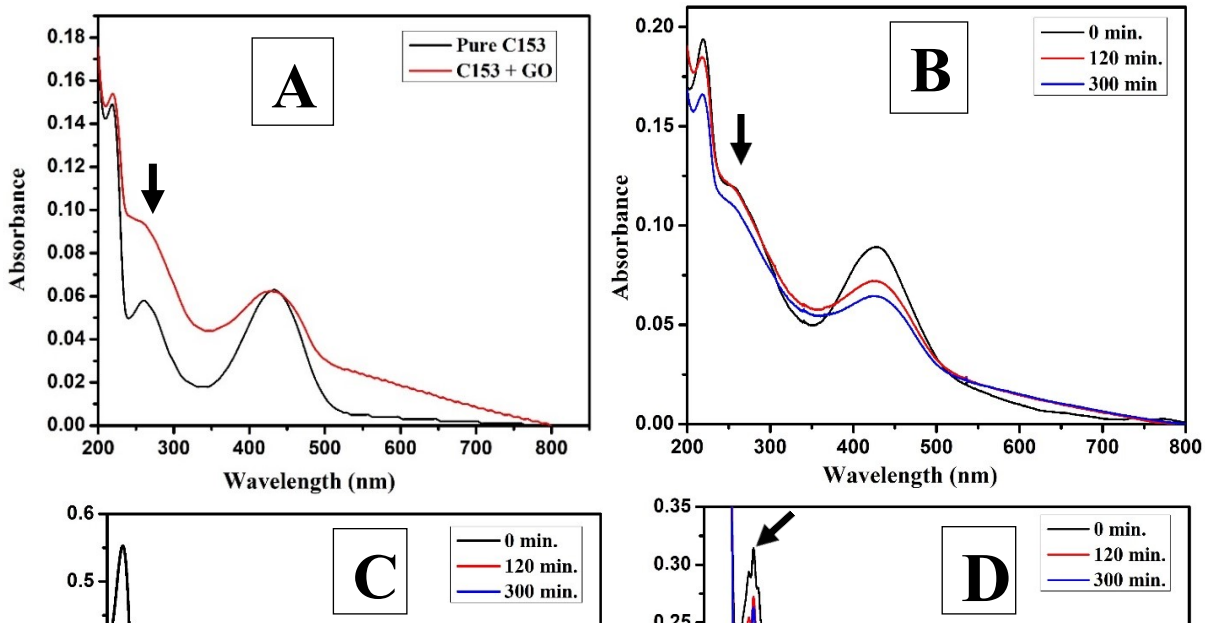

Fig. S4: UV-Vis spectra of C153 & GO-C153 (A). The change in UV-Vis spectra of (B) GO-C153, (C) GO-C153-16-4-16, and (D) GO-C153-CTAT complexes overtime to study the change in surface plasmon (SPR) band of GO in the complexes. The SPR band is designated by solid arrow.