Supplementary information

Development of smart plasma-treated nano-filter using carbon nitride nanostructures for oil-water emulsion separation: experimental and theoretical studies

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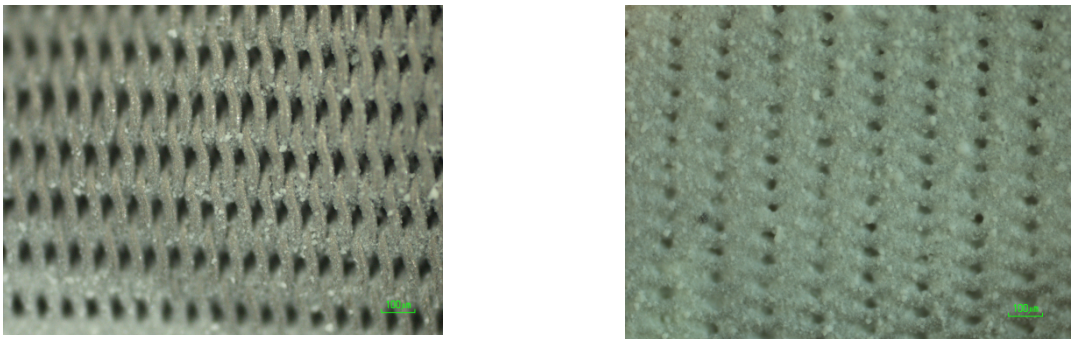
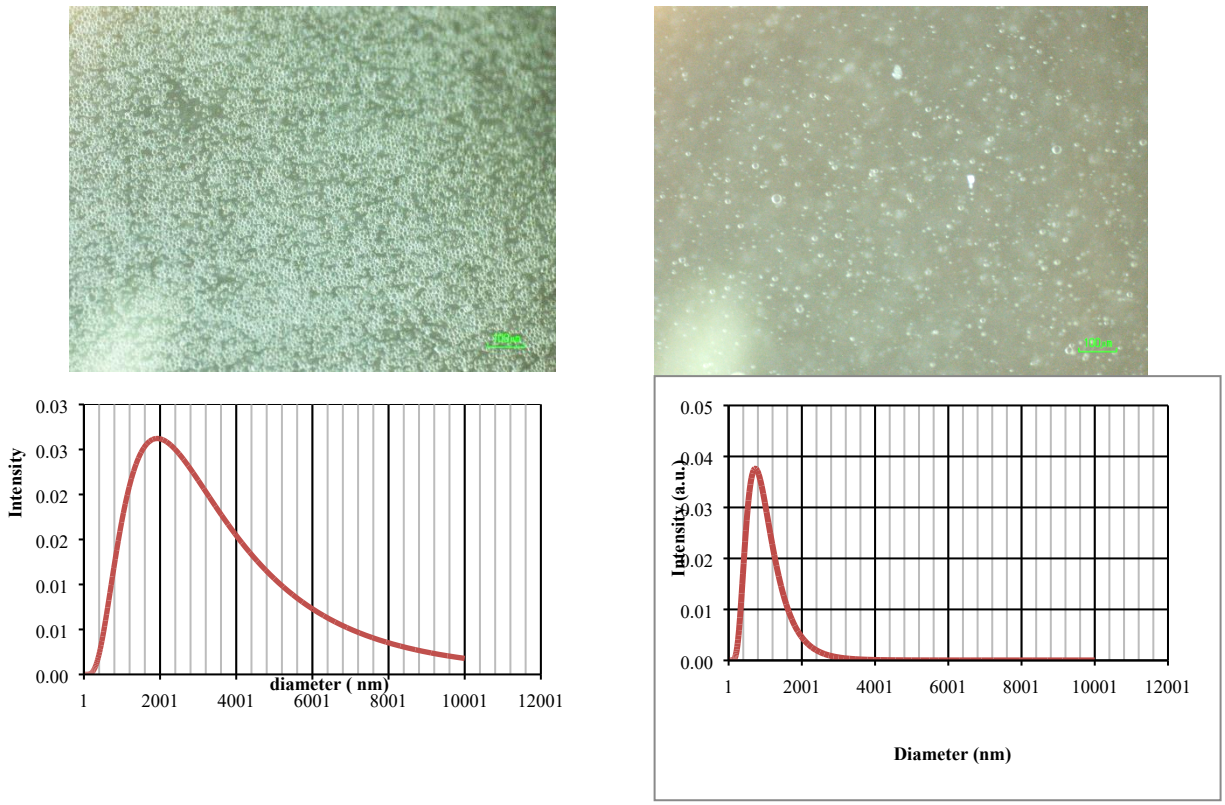
Measurement of underwater oil contact angles

Most hydrophilic surfaces in air exhibit oleophobicity when placed underwater, *i.e.*, the oil drop in its equilibrium configuration shows an underwater contact angle greater than 90°. In order to measure the contact angle of oil under water, an open PlexiGlass chamber (7 cm × 7 cm × 7 cm) was made, in which two holders were placed to mount the filter. The oil injection site was situated at the bottom of the chamber. After placing the sample, the chamber was filled with water so that the filter was completely submerged. Then 5 µl of oil was injected into the chamber filled with water using a syringe connected to a micro-pump. The drop of oil under gravity is separated from the tip of the needle and moves upwards (due to the lower density of oil than water) and forms a contact angle with the filter.



a b

Figure S1: optical microscopy images of the b-CN5 coated mesh filter after a) one, and b) three times dip-coating steps.



a b

Figure S2: Droplet size distribution of water-in-decalin emulsion before and after separation by a b-CN5 coated mesh filter. Optical microscopy images and DLS spectra of a) feed, and b) permeate.

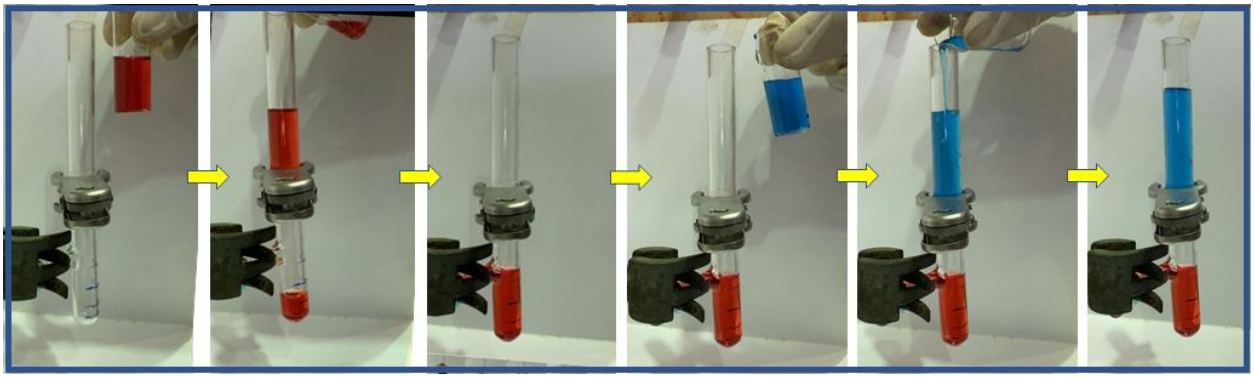
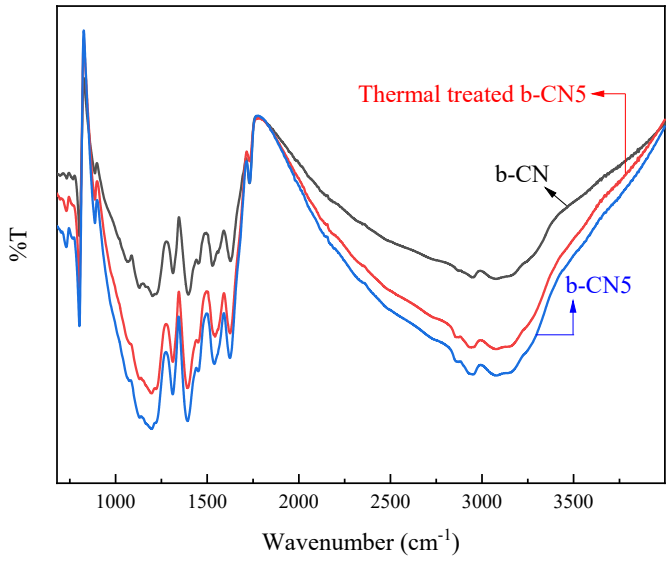


Figure S3. Photographs showing the separation process in oil-removing state using the b-CN5 coated mesh; water is dyed with methylene blue, and decalin is dyed with Oil Red O.

1



2

3 Figure S4: FTIR spectra of b-CN (black), plasma treated b-CN5 (blue) and thermally treated b-
4 CN5 (red) coated meshes.

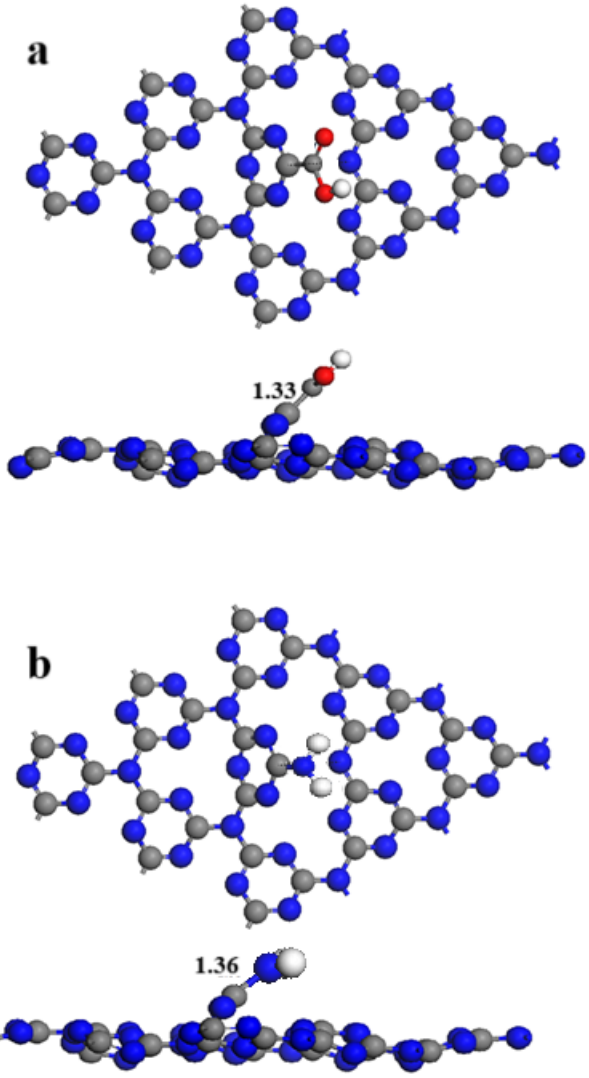


Figure S5: Top and lateral views of the optimized configuration of a) COOH and b) NH_2 adsorbed on g-C_3N_4. C, N, O and H atoms are represented as grey, blue, red and white spheres, respectively. Adsorption of the COOH and NH_2 leads to the scission of a C-N bond of the substrate. As a result, the triazine ring bonded to the functional group protrudes above the layer.