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Synthesis of a redox-active pyrene-F_LF_L-dopamine amphiphile and investigation of their self-assembly at different *p*H leading to microfibrous formation

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N-(1-((1-((3,4-Dihydroxyphenethyl)amino)-1-oxo-3-phenylpropan-2-yl)amino)-1-oxo-3-phenylpropan-2-yl)-4-(pyren-1-yl)butanamide (Py-F_L-F_L-DP) has been synthesised using the traditional amide coupling reactions of 1-pyrene butyric acid, boc-l-phenyl alanine, l-phenyl alanine methyl ester and dopamine. Py-F_L-F_L-DP shows a *p*H dependant aggregation between *p*H 4 and 10 which can be monitored spectroscopically, resulting in a reversible quinone/hydroquinone oxidation – reduction transformation of the dopamine moiety. The photoexcitation of Py-F_L-F_L-DP at λ_{ex} 345 nm at higher *p*H preferentially results in aggregation induced emission (AIE) photorelaxation mechanism in comparison to thermal relaxation or intramolecular charge transfer (ICT). SEM micrographs show the formation of fibrillar nanostructure with increasing *p*H specially at *p*H 10. The CD experiment offers deeper insights into the chirality that developed in the nanofiber self-assemblies at *p*H levels 7 to 10, which is attributed to the twisted conformations of the pyrene moieties within the self-assembled structure. The unique *p*H-dependent self-assembly and redox behavior of Py-F_L-F_L-DP, particularly its reversible optical and structural changes in response to *p*H variations, make it a promising candidate for real-time *p*H monitoring in biomedical applications, such as intracellular imaging and the design of controlled drug delivery systems targeting *p*H-sensitive environments.

Keywords: Pyrene, Dopamine, L-Phenylalanine, UV-Vis, Emission, Self-assembly