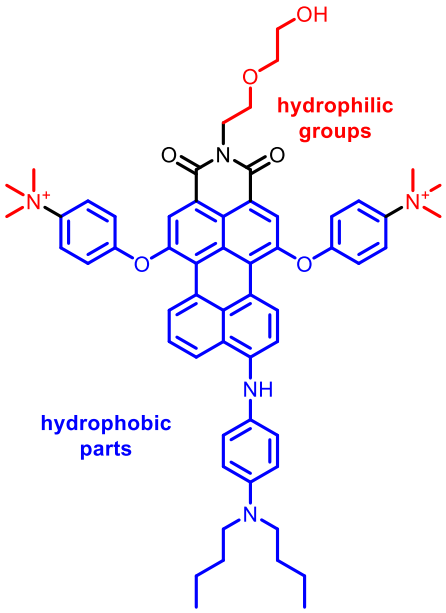
Perylene surfactants

Perylene 3,4,9,10 tetracarboxylate derivatives, like the perylenebisimide (**1**) depicted above, are fantastic molecules with excellent physiochemical properties. They are the most stable organic chromophores known to (and made by) man and they are highly fluorescent with fluorescence quantum yields close to 1.[1] Solubility is generally limited to (chlorinated) organic solvent, which severely limits their use.



This proposal aims at the design, synthesis and application of amphiphilic perylenes, soap-like molecules that contain both a polar water-soluble part, and an apolar part. Such molecules are soluble in both polar and apolar solvents and be able to form micelles, reversed micelles or vesicles in these solvents. For the apolar perylene molecules this amphiphilic behavior is induced by attaching multiple polar groups at one side of the molecule, as can be seen in the molecule depicted here.

Her we propose the design, synthesis and investigation of the physiochemical properties of amphiphilic perylenes. We are particularly interested in the ordering of these molecules at interfaces. Ultimately we would like to find out if it is possible to orient these molecules at a liquid-liquid interface. Combined with appropriate photochemical behavior,[2] such monolayers may be capable of unidirectional electron transfer over this interface as a key step in the design of artificial photosynthesis.

This proposal is involved with the design and synthesis of organic molecules. In the later stages characterization of monolayers at interfaces, photochemistry and electrochemistry will be employed. This proposal is suited for both BSc and MSC research.

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[1] Huang, C.; Barlow, S.; Marder, S. R. *J. Org. Chem.* **2011**, *76*, 2386−2407.

[2] Li, C.; Schöneboom, J. Zhihong Liu, Z.; Pschirer, Erk, P.; Herrmann, A.; Müllen K. *Chem. Eur. J.* **2009**, *15*, 878 – 884.