

Triptycene-based oligo(ethylene glycol) amphiphile: Synthesis and applications in aqueous solution

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Triptycenes have been widely applied in molecular machine and surface chemistry. Because of a unique rigid propeller-like structure of triptycenes, various applications, such as molecular wheels and motors, were achieved. It also shows a high-density ordered hexagonal arrangement on surfaces and in solid states.¹ However, the poor solubility in water and different organic solvents limits the applications in solutions. Here, we explored the applications of triptycenes in water by modifying triptycene with oligo(ethylene glycol).

First, tosylated oligo(ethylene glycol) and triptycene were synthesized based on reported procedure.² Different amphiphiles were synthesized composed of triptycene as hydrophobic and oligo(ethylene glycol) as hydrophilic parts.

The amphiphiles are solid at room temperature, differed from similar amphiphiles based on phenyl groups. The powder x-ray diffraction analyses showed that they are crystals. These results suggest that triptycenes dominate the arrangement of the entire amphiphiles, despite the fact that triptycene is not a major component.

Then, the properties in solutions, especially in aqueous solution, were studied, such as solubility, spectroscopies (UV-Visible and/or fluorescence spectra), and aggregation states (dynamic light scattering and critical aggregation concentration). We will also demonstrate potential biological applications in aqueous solutions, such as protein stabilizations and lipid-bilayer incorporations.

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