Laboratoire PPSM – UMR CNRS 8531

Photochimie et Photophysique Supramoléculaires et Macromoléculaires

Séminaire PPSM

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Bâtiment Cournot Salle 321

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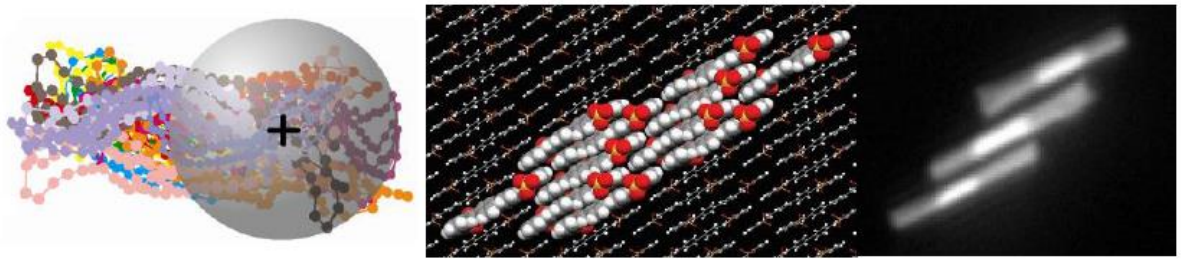
Invité par : Robert Pansu

«Collective behaviors of self-assembled matters in Chemistry»

Interesting function manifests when individual matters assemble in an ordered fashion and interact collectively. Collective behaviors have been observed over a wide range of size scale. Widely studied examples in nature are a flock of birds and a school of fish. When the size scale decreases, the mechanism of interactions between individual matters is different from that of birds or fishes. However, interesting properties do manifest at nano- and micro-scale when the "order" in assembled structures is achieved through self-assembly, which attracts scientists across many disciplines. In this presentation, three examples of the extraordinary property achieved by self-assembly will be discussed. The first example is the energy transfer length scale in individual conjugated polymer chains that fold into rod-like ordered domains. Single molecule spectroscopy revealed that the energy transfer in ordered domains can be a magnitude of order more efficient than that in disordered chains. In some systems, unusual blinking behavior of fluorescence from ~40 MDa size polymer aggregates can be observed. The second example is the optical spectrum of single crystal of dyes that are assembled through two dimensional hydrogen-bonded molecular frameworks. In such frameworks, dyes are forced to pack in face-to-face fashion, which results in strong electronic interactions and enormous spectral shift compared to the solution spectrum. The significance of face-to-face packing motifs will be highlighted by comparing the results with the spectral shift in a face-to-edge packing motifs. The last example is the assembly of artificial microscale swimmers (microswimmers) which are cylindrical rods composed of gold and platinum segments. While an individual rod composed of Au-Pt-Au segments does not show any directional motion, rotational or propelling motions were observed as the rods interact and self-assemble. Collective behaviors of these active matters are yet mostly unpredictable, but it is a promising system for realizing micromachines with more complex function that are built from simple components.



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