Dye Aggregation Driven by Intermolecular Hydrogen Bonds

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Some alkylated merocyanine dyes form "J-aggregates" that are self-organized functional supermolecules in their monolayers prepared upon aqueous subphases containing metallic cations such as Mg^{2+}. "What drives the J-aggregation?" was an open question because the molecules' static dipoles may prefer another type of aggregate. Recently, it has been found that one of those dyes forms a J-aggregate upon pure water and a detailed infrared absorption study of this new J-aggregate has answered to that question. That is, the large dielectric constant of water enables intermolecular hydrogen bonds (or metal chelation) to drive the J-aggregation against the interaction between the dipoles.

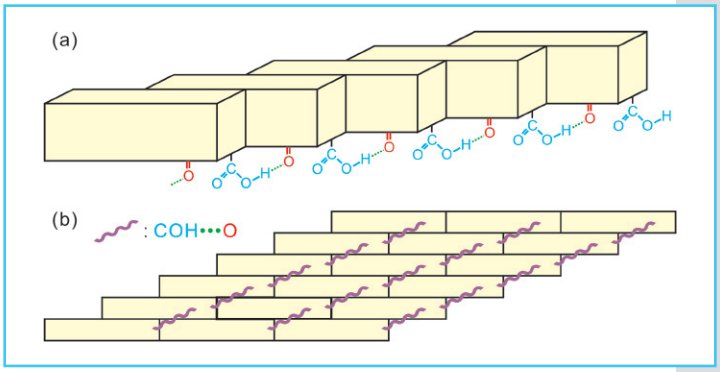

Fig. Merocyanine dye molecules are connected by intermolecular hydrogen bonds (a) and then stacked side-by-side by electrostatic force (b), giving rise to formation of ribbon-shaped J-aggregates.

New Method of Synthesizing Organic Hydrogen Storage Materials for Fuel Cells

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We have developed technology for synthesizing decalin, a promising material of hydrogen storage for fuel cell through the combination of supercritical carbon dioxide with a supported metal catalyst. This process has merits of low temperature, high selectivity, high efficiency, easy recovery of decalin, and capability of recycling carbon dioxide solvent. It is expected to contribute to the implementation of hydrogen storage materials synthesis system to reduce the environmental burden.

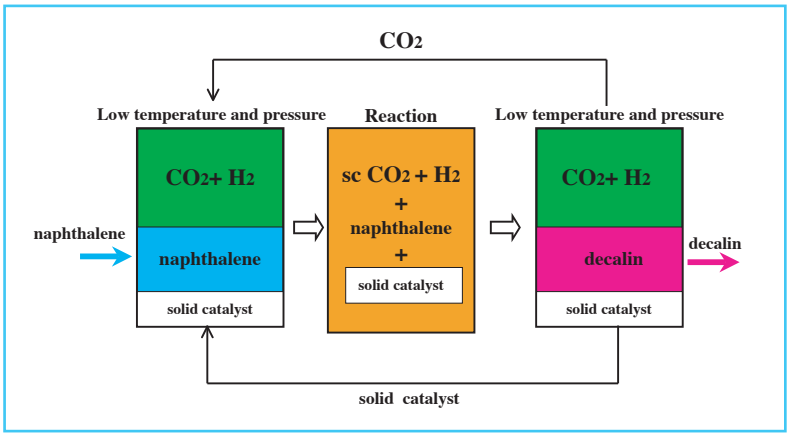

Fig. Multi-phase catalytic reaction system with supercritical carbon dioxide.