Amplified Photochemical Response in Molecular Synergetic Systems

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Abstract:

Photochemical responses of molecules strongly are strongly affected by the Intermolecular interaction. Molecular synergetic interaction enhances photoemission properties and photochemical reactivity of various molecules. In this presentation, some recent examples of amplified photochemical response of photochromic molecules and fluorescence emissive molecules will be delivered, especially focusing on our research team at Nara Institute of Science and Technology.

Usual photoisomerization reaction of some photochromic molecules displays QY of much smaller than unity. Some of photochromic molecules such as diarylethenes and related substances display diverse ground state structures among reactive and non-reactive conformations. Their QY is readily improved by enhancing population ratio of the reactive conformation. Meanwhile, some previous studies on organic substances have been reported Quantum Chain reactions, in which QY becomes beyond unity. Typically, triplet-state inter-molecular energy transfer promotes cascade reaction pathway with amplified quantum yield.[1.] We have recently focused on some cascade reaction based on charge transfer reaction[2]. We further succeeded in the radio-chromic chain reaction of terarylenes under illumination of weak X-ray. By using appropriate solvent system, this amplified radio-chromic system became reversible under different wavelength of UV light. The cascade photochromic color-fading was expanded to use in efficient fluorescence switching by means of microcapsule system.[2]

Our interest has also been expanded for chiroptical response of functional molecules. Enhanced circularly polarized luminescence of molecular aggregates and supramolecular systems. We also recently investigated photo-racemization reaction based on axially chiral biaryl derivatives, which displays enhanced photochemical quantum yields of close-by or even beyond the unity.

References:

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