Aggregation Induced Emission tells us molecular aggregation processes

The aggregation-induced emission (AIE) is the phenomena that the fluorescence intensity is low in solution, the aggregated state shows strong emission. Conversion of the fluorescent properties depending on the aggregated states can also provide information on the evolution of the aggregation processes. Molecules that are non-emissive in solution suddenly become highly emissive owing to aggregation and segregation. In addition, the temporal evolution of the emission can visualize a series of complex interfacial assembling processes through the change in color and intensity of the emission being strongly dependent on the property of the aggregation state. In comparison to conventional real-time imaging methods, AIE imaging technology is simple yet highly specific and sensitive, offering a clear view.

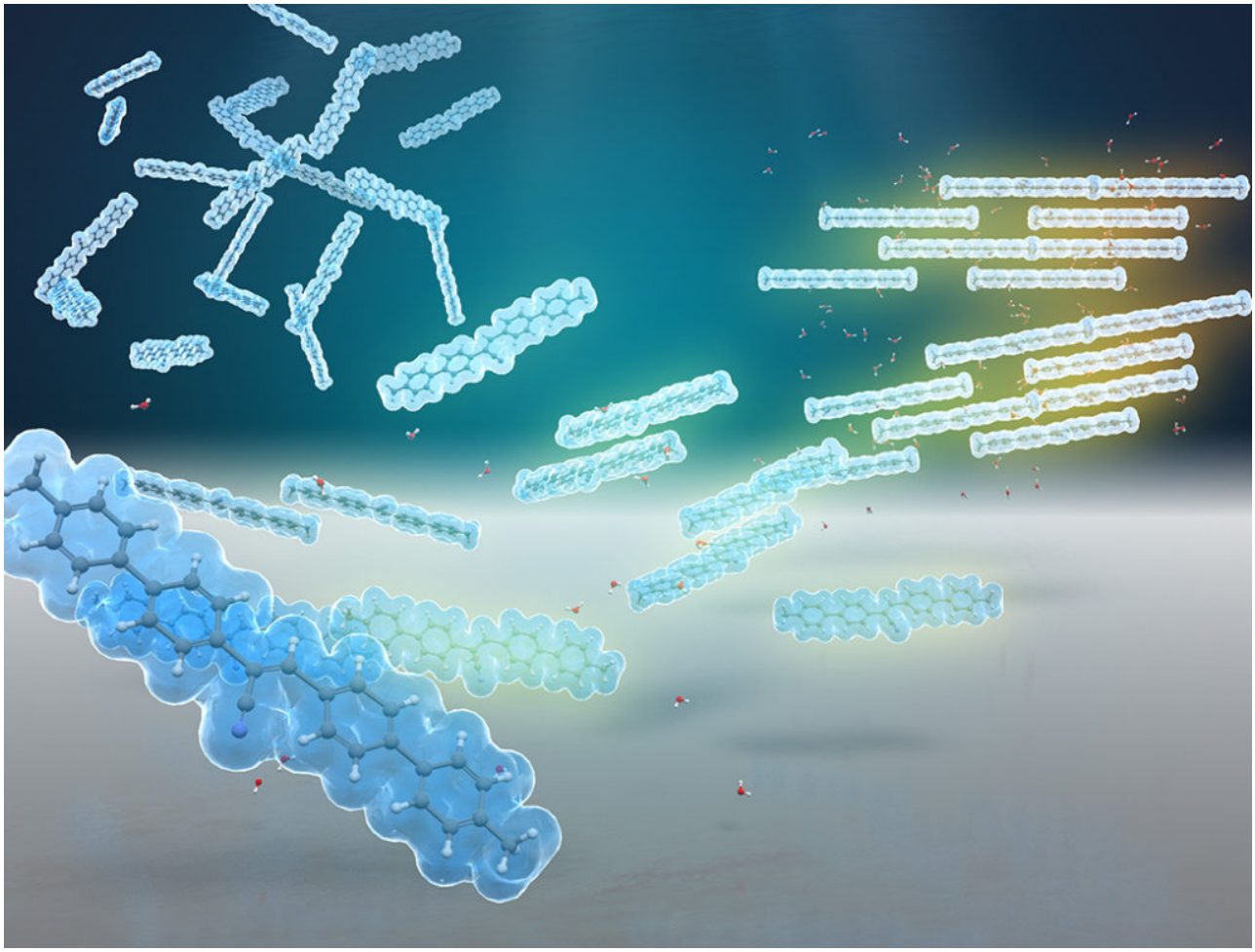

Fig. 1. Image of the molecular assembling process.

We have applied AIE to the dynamics of crystal formation and recently pointed out that the spectroscopic evolution during solvent evaporation could provide information about molecular assembly processes because AIE enables selective detection of the assembly dynamics of aggregates and crystals. Specifically, we investigated the AIE of cyanostilbene derivative 1-cyano-*trans*-1,2-bis-(4'-methylbiphenyl)-ethylene (CN-MBE). However, the solvent evaporation process complicates the extraction of detailed information about molecular packing structure and aggregate size. Static observation provides insight into the relation between the fluorescence properties and aggregation structure of a material. In this paper, we used emission spectroscopy to elucidate the molecular dynamics of the initial stage of crystal formation of CN-MBE by detecting the temporal evolution of its emission spectrum and intensity of AIE in nanoparticle solutions as a function of the volume fraction of a poor solvent (water) in the solutions. Chemometrics analysis allowed extraction of the fluorescence excitation spectra of the individual species and aggregates. The results suggest that the J-dimer of CN-MBE acts as a precursor in the crystal formation process and accelerates the formation of larger aggregates. Integrating these results allowed us to examine the molecular dynamics in the initial stage of crystal formation as revealed by AIE.

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AIE phenomena of a cyanostilbene derivative as a probe of molecular assembly processes.
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