Preparation of Photoresponsive Microcapsules for Fluorescence Modulation

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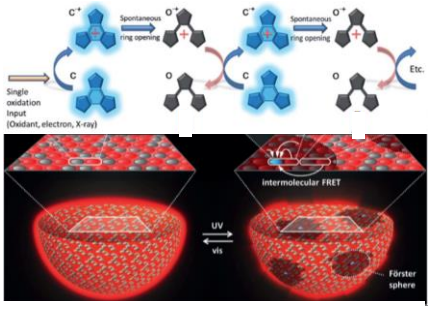

Fig. 1. Cascade effect[1] (top) and AFPS (bottom) phenomena[2].

Terarylenes are a family of photochromic diarylethenes that have been found to undergo the cascade effect, a highly efficient ring opening process in solution that leads to cycloreversion quantum yields above 1 after UV irradiation.[1] We are currently attempting to further increase this sensitivity by including a fluorophore to induce amplified fluorescence photo-switching (AFPS), the phenomenon of reversible quenching due to very efficient intermolecular FRET (Fig. 1).[2]

To confirm the presence of the AFPS phenomenon, we placed a chosen terarylene and BODIPY derivative in PMMA thin film and irradiated the system at certain time intervals to induce several cycles of ring closing and cycloreversion of the terarylene. The change in absorbance of terarylene and fluorescence of BODIPY were measured, and Fig. 2 shows a nonlinear relationship between fluorescence and absorbance indicating AFPS.

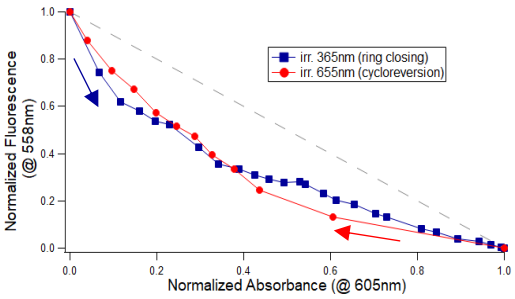

Fig. 2. Nonlinear fluorescence intensity change at different degrees of photocyclization.

Two terarylene-fluorophore pairs were also placed in a microcapsule system[3] to also have access to the cascade effect. Fluorescence switching was observed for several cycles.

1) Asato, R., et al. *Chem. Sci.* **2020**, *11*, 2504. 2) Su, J., et al. *Angew. Chem., Int. Ed. Engl.* **2016**, *55*, 3662. 3) Leong, J. et al. *ACS Appl. Mater. Interfaces*. **2015**, *30*, 16169.

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