Exciplex Mechanochromism and Vapochromism for Sequential and Differential Sensing

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Mechanochromic luminescent (MCL) materials display luminescence color change in response to mechanical forces, such as grinding, pressing, and shearing. Potential applications of MCL materials include sensors, rewritable optical displays, security printing, and data-storage devices. While many dichromatic MCL systems have been developed, multicolor counterparts that allow multicolor luminescence drawings are rare.

Exciplexes are excited heterodimeric charge-transfer complexes that emit longer wavelength light than the individual components. In the solid state, exciplexes play an important role in contemporary development of white, blue, and infrared organic light-emitting devices (OLEDs). Regarding vapochromic luminescent (VCL) materials, which change the luminescence color in response to vapor stimuli, exciplex formation could be an effective strategy toward multicolor responses. However, examples of exciplexes formed between a solid host and a vapor guest are very limited.

We recently reported that compound 9,10-Pp (Fig. 1) is a MCL and exciplex-based VCL material.[1] The rigid bulky H-shaped pentiptycene scaffold also induced a novel character of force-induced fluorescence-color memory.[2] Consequently, a multicolor fluorescence drawing could be achieved, as represented by the "Apple, Banana, and Orange" drawing.[1]

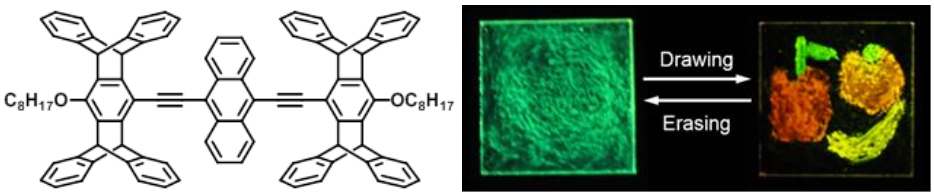

Figure 1. Structure of 9,10-Pp (left) and its performance for multicolor fluorescence drawing (right)

To demonstrate the potential utility of 9,10-Pp as sensory materials for chemical vapors, we have carried out sequential and differential sensing of a series of aniline vapors, including aniline, *N*-methylaniline, *N*,*N*-dimethylaniline (DMA), *N*,*N*-diethylaniline, *N*,*N*-diisopropylaniline, and substituted DMAs, through array pattern and principal component analysis. The details of sensing strategy and performance will be provided in this presentation.

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References:

[1] Y. Matsunaga, J.-S.Yang, *Angew. Chem. Int. Ed.*, **2015**, *54*, 7985-7989.

[2] J.-S. Yang, J.-L. Yan, *Chem. Commun.* **2008**, 1501-1512.