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Penttiptycene-Containing Oligo(*p*-Phenyleneethynylene)s

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Oligo(*p*-phenyleneethynylene)s (OPEs) have been the key components in many π -conjugated systems and electronic materials. It is well documented that OPEs are strongly fluorescent and the π -backbone conformation (planarity) of OPEs plays a crucial role in determining the optical properties. However, torsion of the phenylene rings in OPEs is nearly barrierless (< 1 kcal mol⁻¹), which makes conformational engineering of OPEs a challenging task. On the basis of temperature-variable electronic spectroscopies, our studies on a series of penttiptycene-derived OPEs revealed that electron-withdrawing substituents facilitate the twisting of neighboring phenylene rings in OPEs, but electron-donating substituents favors a coplanar π -backbone. In addition, it is the iptycenylic electronic rather than steric effect that causes the observed backbone twist of the penttiptycene-containing OPEs. The substituent electronic effect on the π -backbone conformation of OPEs will be interpreted with the π -polarizability of phenylene rings. By incorporating Pt atom into the π -backbone, the conformational freedom is associated with fluorescence-phosphorescence dual emissive properties of OPEs. Besides the backbone conformation, intermolecular π - π interactions and electron donor-acceptor interactions that lead to fluorescence-color changes have been observed for penttiptycene-anthracene hybrid OPEs in the solid state. In particular, we discovered the phenomenon of force-induced fluorescence color memory, which provides a venue for multicolor fluorescence writing on thin solid films with mechanical forces. The structural and mechanistic aspects of these observations will be discussed.

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