Enantioselective energy transfer on the chiral nanofibers.

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The chiral supramolecular nanofibers are a broad class of materials exploited in formation of supramolecular gels, molecular recognition, light harvesting, organic optoelectronics, cell culture and catalysts.[1,2] Supramolecular chiral nanofibers especially through self assembly of chromophoric systems afford platforms for energy migration/transfer[2, 3] and can also be resulted in emergence of circularly polarized luminescence(CPL).[4] CPL is not only as a source of structural information of the involved excited states but also it has potential applications in the improvement and development of multiple photonic tools such as display devices including 3D optical displays, optical storage and processing systems, spintronic based devices, biological probes and signatures, security tags, CPL lasers, enantioselective CPL sensors.[5]

We herein report a chiral bichromophoric naphthalenediimides(NDI) derivative(denoted as donor(**D**)) self assembled into a fluorescent nanofiber in methylcyclohexane(MCH) rich solvent which shows enantioselective energy transfer to a binaphthalene derivative bearing two perylenediimide (PDI) moieties(denoted as acceptor(**A**)) [Fig. 1a)]. The enantiomeric nanofibers exhibited the efficient light harvesting property for the chiral guest PDI molecule with one-handedness, which was completely absent when paired with the guest possessing the other handedness as result of preferred heterochiral binding [Fig. 1b)]. Acceptor chiral PDI molecule was also reported to self-assemble into nanofibers in an MCH-rich solution to give emission band at 630 nm.[5] However, the appearance of emission maximum at 540 nm in our molecular systems is corresponding to non-aggregated molecularly dispersed state, indicating that (*S*)-**A** binds to with (*R*)-**D** in an isolated manner. Hence our donor-acceptor system shows almost absolute enantioselective recognition of a chiral perylenediimide (PDI) molecule by chiral supramolecular nanofibers of NDI derivative. The chiral recognition was evaluated through the Förster resonance energy transfer (FRET) from the host NDI-based nanofibers to the guest PDI-molecule. The enantioselective sensitization of circularly polarized luminescence (CPL) from the guest molecule was also demonstrated, which successfully switched the wavelength band and sign of CPL signal in response to the chiral guest molecule [Fig. 1c)]. Hence, our system can be use as enantioselective CPL sensors. [6]

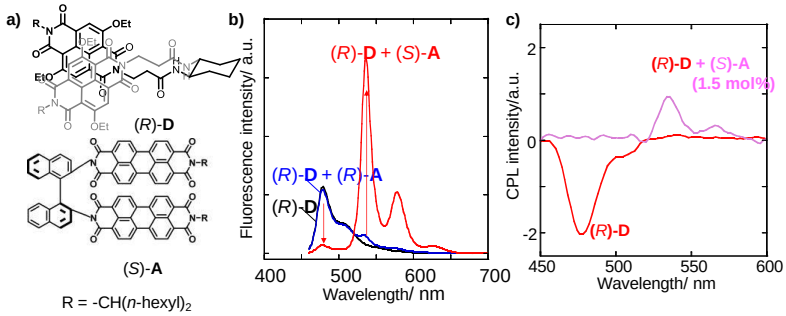

Figure 1. a) Molecular structure of donor and acceptor, **b)** emission profile for energy transfer and **c)** CPL profile.

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