Title:	Room-Temperature Columnar Nematic and Soft Crystalline Columnar Assemblies of a New Series of Perylene-Centred Disc Tetramers
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Abstract:	Three new oligomeric perylene (PE) tetraester derivatives, consisting of a PE-based core with four pentaalkynylbenzene units attached through flexible alkyl spacers, are reported. These derivatives were investigated for their mesomorphic properties and thermal, photophysical, and electrochemical behaviour. Small- (SAXS) and wide-angle X-ray scattering (WAXS) studies were performed to deduce the exact nature of the phases. To resolve overlapping reflections and facilitate their indexing, grazing-incidence SAXS/WAXS experiments were carried out on oriented thin films on indium tin oxide (ITO)-coated glass substrate. The corresponding electron density maps were derived from the intensities observed in the diffraction pattern. Whereas compounds with shorter alkyl spacers (n=6 and 8) were found to self-organise into soft crystalline columnar assemblies, those with longer spacers (n=10) exhibited a liquid-crystalline columnar nematic mesophase. This is in contrast to previous reports that describe highly symmetric 2D hexagonal and rectangular columnar structures of PE-based mesogens. The morphology of self-assembly was found to transform from soft crystal columnar to nematic columnar phase through simple variation in the number of alkyl spacers. All compounds exhibited excellent fluorescence emission properties with a very good quantum yield and large band gap. Apart from high solubility and good quantum yield, these compounds can serve as standards to measure quantum yields of unknown samples. These compounds also display green luminescence and may find applications for various optoelectronic devices.
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