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| Title: | Design and Development of Novel Room Temperature Discotic Nematic Liquid Crystals |
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| Abstract: | In thermotropic discotic liquid crystals, the interaction between molecules is essen- tial in determining if the compound exists in a nematic phase or a columnar phase. A unique strategy for designing nematic discotic liquid crystals (N D ) using alkyl biphenyls and alkyl phenyls diagonally attached to a benzene core via alkynyl linkers has been reported earlier. Here, we use this idea and develop a new method to syn- thesize room temperature nematic discotic liquid crystals by breaking the molecular symmetry. We synthesize 2,4,5-tribromophenol and use it as the central core for the liquid crystalline molecules. The synthesized nematic liquid crystals (A and B) have 4-ethynyl-4'-pentylbiphenyl substituted at the bromo positions of the core, and the phenolic hydrogen substituted with hexyl and 3,7-dimethyloctyl chains, respectively. On characterization using polarized optical microscopy (POM), we confirm the ex- istence of both A and B in a discotic nematic mesophase. Both compounds A and B transition from crystalline to nematic mesophase at temperatures above 112 ◦ C. However, A exists in the nematic mesophase till 31.1 ◦ C on cooling, bringing us closer to achieving a room temperature discotic nematic liquid crystal. Compound B, on the other hand, exists in the nematic mesophase within a relatively short temperature range, and it undergoes a phase transition into a crystal at 50.6 ◦ C on cooling. Discotic nematogens, although rare, are especially interesting because of their applica- tions in LC displays for providing better viewing angles. Achieving room temperature nematic discotic liquid crystals open applications in a wide range of devices and for commercialization. |
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