A new strategy towards the synthesis of room-temperature discotic nematic liquid crystals

Monika Gupta and Santanu Kumar Pal*

Department of Chemical Sciences, IISER Mohali
Manauli- 140306, Mohali, INDIA
(E-mail: skpal@iisermohali.ac.in)

Abstract:

Discotic liquid crystals (LCs) formed mainly by disc-shaped molecules generally give rise to columnar mesophase because of strong π-π interaction among the aromatic cores. However, disc shaped molecules showing nematic phase (i.e. N_D phase) are rare but of utmost importance in many display device applications. They have garnered particular interest owing to their commercialization as optical compensation films to enhance the viewing angle of commonly used LC display based on polymerized nematic discogens. Unfortunately, most of the discotic nematogens reported so far exhibit N_D behaviour at high temperature and over a narrow temperature range. In contrary, implementation of nematic discogens in devices necessitates N_D phase at room temperature. However, till date, only a few approaches have been reported for the formation of room-temperature N_D phase.

We have reported recently a new design for the realization of room-temperature N_D phase employing two disc-like cores consisting of a triphenylene & pentaalkynylbenzene units linked via flexible alkyl spacers. The earlier examples of symmetric dimers based on pentaalkynylbenzene show N_D phase at higher temperature. We revealed that incompatibility of the two discs in the folded mesogen leads to improper packing resulting into the formation of a room-temperature N_D phase which persists over a wide range. Earlier we demonstrated that linking a pentaalkynylbenzene unit with a triphenylene core through flexible alkyl spacer containing a short rigid ester group in centre leads to columnar mesophase at ambient temperature.[1-2] In contrast, further increasing the flexibility of spacer, i.e., by introducing only alkyl chains leads to the desired mesophase at room temperature.

References and Notes:

1 Gupta, M.; Bala, I. and Pal, S. K. *Tetrahedron Lett.* **2014**, *55*, 5836-5840.
2 Gupta, M. and Pal, S. K. *Langmuir* **2016**, *32*, 1120-1126.