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# Synthesis of bent-core azobenzene oligosiloxane end-groups induces to polar order in liquid crystalline phases by achiral molecules

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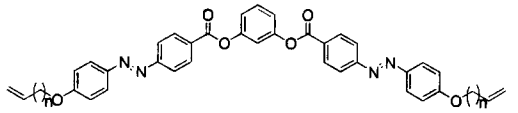
## 1. Introduction

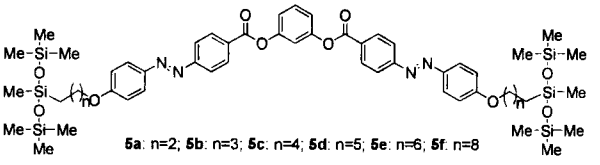
Anisotropic materials having potential applications in display and other devices, liquid crystals (LC) research has made significant progress during the last few decades [1]. Owing to the attractive electro-optic switching characteristics, banana-shaped LCs has been attracted to the scientific attention enormously [2]. The relationship between their molecular structure and their mesomorphic properties is one of the highly investigated research topics for bent core LCs. The polar order of these molecules, owing to their bent shape, displays interesting properties such as ferroelectric or anti-ferroelectric switching [3]. The occurrence of superstructural chirality in the mesophase of bent-core compounds without having any chiral moiety in the molecules is not only of fundamental scientific interest but also of industrial application as this chirality can be switched in external electric fields. In this study, a new series of bent-core liquid crystals with oligosiloxane end-groups were synthesized and characterized.

## 2. Results and discussion

A bent-core liquid crystalline monomers incorporating resorcinol is the central unit linked to the azobenzene as the side arms with terminal double bonds as polymerizable functional groups, were synthesized and characterized by POM, DSC, XRD and UV-vis spectroscopy. Bent-core compounds, 4a consist of even of carbons and 4b conatins odd number of carbons in each terminal group exhibited intercalated smectic (B6) phases while compounds 4c-f of the same series showed rectangular columnar (B1) phases (top of Fig. 1). A series of bent- core, oligosiloxane units and alkyl segments were derived from these monomers molecules, and the self-organization of these molecules was investigated (bottom of Fig. 1). In this case lower alkyl homologues showed B6 phase and higher alkyl homologues are organized into polar smectic liquid crystalline phases. With increasing length of the alkyl chains, segregation is lost and a transition from smectic to a columnar phase is found. In the columnar phase, the switching process is antiferroelectric and takes place by rotation of the molecules around the long axes, which is switched into a homogeneous chiral structure upon application of an electric field. Hence, it was observed that the some combination of microsegregation with the special packing properties of the bent cores enables the design of new complex soft matter systems with switchable polar order.



**4a**: n=2; **4b**: n=3; **4c**: n=4; **4d**: n=5; **4e**: n=6; **4f**: n=8



**5a**: n=2; **5b**: n=3; **5c**: n=4; **5d**: n=5; **5e**: n=6; **5f**: n=8

**Figure 1: A series of bent-core azobenzene containing oligosiloxane end-groups**

## 3. Acknowledgements

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## 4. References

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