

Ionic Liquid Crystals Derived from Piperidine, Morpholine and Piperazine

Kathleen Lava^a, Karel Goossens^a, Thomas Cardinaels^a, Koen Binnemans^a

^a *K.U.Leuven, Department of Chemistry, Celestijnenlaan 200F, B-3001 Leuven*
E-mail: kathleen.lava@chem.kuleuven.be

Ionic liquid crystals are of great interest because they combine the properties of ionic liquids and liquid crystals. A wide variety of ionic liquid crystals has already been investigated, mostly quaternary ammonium, imidazolium and pyridinium salts.⁽¹⁾ Recently we reported on pyrrolidinium ionic liquid crystals, where an uncommon smectic T phase was observed.⁽²⁾ Liquid-crystalline behaviour induced by ionic self-assembly is strongly dependent on both cation and anion. In this research three new cationic cores, namely, piperidinium, morpholinium and piperazinium, were combined with classical anions and with less common sulfosuccinate derivatives, as shown in figure 1.

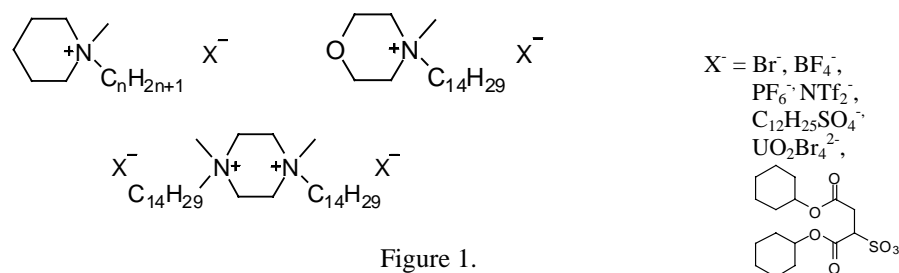


Figure 1.

The thermotropic liquid-crystalline behaviour was studied using polarizing optical microscopy, differential scanning calorimetry and X-ray diffraction. The chain length of the N -alkyl- N -methylpiperidinium bromides was varied from octyl to octadecyl. A minimum chain length of twelve carbon atoms was necessary to obtain liquid-crystalline compounds. Introducing an oxygen atom in the cationic core results in the formation of hexagonal columnar phases at room temperature. Highly ordered smectic phases and smectic A phases were observed for the other compounds.

References

- (1) K. Binnemans, *Chem. Rev.* **2005**, *105*, 4148-4204
- (2) K. Goossens, K. Lava, P. Nockemans, K. Van Hecke, L. Van Meervelt, K. Driesen, C. Görrler-Walrand, K. Binnemans, T. Cardinaels *Chem. Eur. J.* **2009**, *15*, 656-674