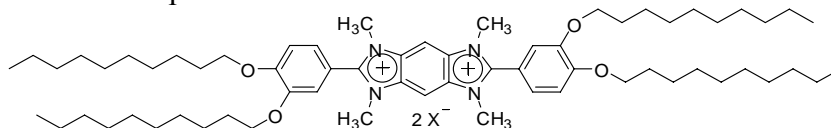


Ionic Liquid Crystals Based on Imidazolium and Pyrrolidinium Cores

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

*a Katholieke Universiteit Leuven, Department of Chemistry,
Celestijnenlaan 200F, 3001 Leuven (Heverlee), Belgium
karel.goossens@chem.kuleuven.be*

Ionic liquid crystals combine the characteristics of liquid crystals (anisotropy of physical properties) with those of *ionic liquids* (electric conductivity, thermal stability, ‘tuning’ possibilities, ...).⁽¹⁾ Incorporation of a metal ion allows to exploit properties of the metal as well (luminescence, magnetic anisotropy, ...). An overview will be given of our recent work in the field of ionic liquid crystals. Several types of imidazolium- and pyrrolidinium-based thermotropic mesogens were obtained, following four different strategies: (i) the cationic core was connected to a flexible spacer with *terminally* attached mesogenic groups;⁽²⁾ (ii) the cation was connected to *laterally* attached mesogenic groups via a spacer; (iii) the cation was incorporated *within* the rigid core of the mesogen; (iv) simple alkyl chains were attached to a pyrrolidinium core.⁽³⁾ The cations thus obtained were combined with Br⁻, [(CF₃SO₂)₂N]⁻, [BF₄]⁻, [PF₆]⁻, [SCN]⁻, [Eu(tta)₄], [UO₂Br₄]²⁻ and [Eu(SiW₁₁O₃₉)]¹³⁻. For strategies (i) and (ii), the influence of the type and number of mesogenic groups (cholesteryl, cyanobiphenyl, biphenyl benzoates, azo-containing aromatic groups, ...), the spacer length, the cation type and the anion on the mesomorphic behaviour was investigated. We managed to obtain nematic ionic liquid crystals, as well as a luminescent tetrakis β-diketonate lanthanidomesogen. Low-ordered mesophases were found for the imidazolium compounds, while highly ordered smectic phases were additionally found for the pyrrolidinium compounds. Strategy (iii) also led to a wide variety of mesophases (polycatenar behaviour). Some of the compounds possess non-linear optical properties. Simple *N*-alkyl-*N*-methylpyrrolidinium salts, obtained according to strategy (iv), were found to exhibit highly ordered crystal smectic E and (rare) crystal smectic T phases, as well as low-ordered phases.



(1) K. Binnemans *Chem. Rev.* **2005**, *105*, 4148-4204.

(2) K. Goossens, et al. *Chem. Mater.* **2008**, *20*, 157-168.

(3) K. Goossens, et al. *Chem. Eur. J.* **2009**, *15*, 656-674.