Symmetry as a Guiding Principle for Tailoring ILCs

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Ionic liquid crystals (ILCs) have received increasing interest, because they combine properties of ionic liquids with those of thermotropic liquid crystals, resulting in novel charged anisotropic materials with 1D conductivity. On the other hand ILCs can be considered as thermotropic analogues of lyotropic liquid crystals, which are attractive as membrane models.[1] Thus applications are ranging from electrolytes in Grätzel-type dye-sensitized solar cells[2] to transfection agents for biomacromolecules such as RNA.[3] However, despite many studies of structure-property relationships, it is still difficult to forecast mesomorphic properties from a given chemical structure. To overcome this limitation, we have used symmetry in combination with counterion effects to tailor mesomorphic properties of ILCs. Selected examples will be presented, where

- mesophase widths could be increased by the replacement of spherical by congruent anions (e.g. 1),[4]
- thermal stability could be improved by reduction of symmetry,
- mesophases could be shifted to room temperature by bending (i.e. reduction of symmetry, e.g. 2, 3),[5]
- mesophase type could be adjusted by symmetry (e.g. 4 - 6).

References:

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