Sulfur makes the difference: synthesis and mesomorphic properties of novel thioether-functionalized imidazolium ionic liquid crystals

K. C. Kreß,1,* M. Mansueto,1 and S. Laschat1

1 Institute for Organic Chemistry, University of Stuttgart, Stuttgart, Germany

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The introduction of sulfur atoms into organic compounds generates a plethora of opportunities regarding molecular electronics applications. Archetypal examples for such sulfur compounds are thiophenes and tetra(thiafulvalenes. The incorporation of such moieties in thermotropic liquid crystals is also well known. For example, due to the softer sulfur atom with more delocalized d-orbitals discotic hexathioalkyl triphenylenes 1 show a decreased electronic bandgap and charge carrier mobilities, which are up to three orders of magnitude larger than those for the corresponding hexaalkoxy triphenylenes.[1]

The combination of properties of liquid crystals with those of ionic liquids creates the special features of ionic liquid crystals as anisotropically ordered liquid electrolytes. Among the various cationic head groups employed for ionic liquid crystals, imidazolium salts are the most widely used class of compounds. Although, some thiophene-based ILCs are known in the literature, the issue of sulfur-containing ILCs is much less explored as compared to classical thermotropic liquid crystals.

Based on our recent work on glycine-derived imidazolium ILCs,[2] we noticed that incorporation of an amine in the side chain 2 led to improved mesophase widths as compared to the corresponding N-methyl-N-alkylimidazolium salts. We thus wondered whether sulfur would be even more helpful in improving the mesomorphic properties.

The ionic compounds 3 were synthesised characterised by differential scanning calorimetry (DSC), polarizing optical microscopy (POM), and X-ray diffraction.[3]

References: