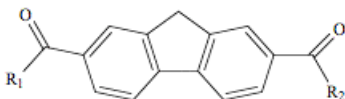


A library of mesomorphic materials for the systematic study of asymmetry and physical properties: the smectogenic 2,7 diacyl fluorenes

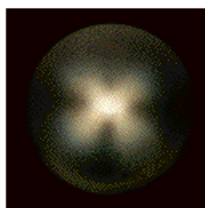
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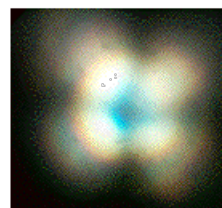
We use a homologous library of liquid crystalline materials to investigate how very subtle changes in molecular structure affect bulk physical properties, such as phases exhibited, energetics, and phase chirality. Our library is unique in that it isolates molecular asymmetry as the independent variable by maintaining constant molecular weight and length. This is accomplished by substituting the fluorene core above with acyl chains having total carbon counts equaling 18. Pure materials and their binary mixtures are studied.

Differential scanning calorimetry and polarized optical microscopy were used previously to show that asymmetry affects both phases formed and their energetics. We aimed this summer to determine whether our molecules behaved as bent-core liquid crystals, which form chiral assemblies from achiral molecules. The effect of asymmetry on the presence of this chirality was also investigated. Conoscopic interference figures were used to evaluate the chirality of the pure materials.

The conoscopic images of 2-hexanoyl-7-lauroyl fluorene below show that our materials align as both chiral and achiral regions simultaneously and spontaneously. The ease of optical alignment of the chiral phase is greatest for the 2-hexanoyl-7-lauroyl fluorene. This may be caused by one of its acyl chains being exactly twice the length of the other and this characteristic's effect on the geometry of its bulk assemblies.



The bright-centered figure on the left is evidence of bulk chirality, while the dark-centered figure on the right indicates bulk achirality. Both images are from the same sample at the same temperature.



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