Biphenyl-(1,2,4)-oxadiazole Liquid Crystals

Sonia Britton, Todd Ness, Christopher E. Ruth, Robert Twieg, and Farid Fouad.

The incorporation of the 1,2,4-oxadiazole entity in the core of a calamitic heterocyclic liquid crystal results in the formation of a bent geometry, known as the "banana structure". This 135^{o} bend angle is what many believe to be the reason for the distinct characteristics absolved from incorporation of oxadiazoles in liquid crystals. Researchers found it intriguing to incorporate oxadiazoles into liquid crystals for organic electrodes because of their charge carrier mobility, exceptional chemical and thermal stability, and high fluorescence quantum yields. Thus far, 1,2,4-oxadiazole mesogenic properties have not been extensively studied, which lead to our research group's fascination in synthesizing a family of unique liquid crystals with potential use in optics technology.

We present the synthesis and mesogenic studies of two novel isomeric libraries of 3- and 5- biphenyl-(1,2,4-Oxadiazole) bent liquid crystals. Variation in the lengths of the two tails results in different mesogenic properties; the short-tailed compounds are non-mesogenic while the medium-tailed members produce nematic phases, and even some medium-tailed compounds show both nematic and smectic A phases. The long-tailed structures produce only smectic phases.A few members have a wide range nematic phase (50 $^{\circ}$C). To reduce transition temperatures, we decided to introduce fluorine atoms at the biphenyl rings. The known high electron transport property of oxadiazoles give these compounds a potential for possible applications in the fields of optoelectronics and displays.