Investigation of Chiral Liquid-crystal Phase Transitions of Chiral Liquid Crystals

Takuma Nozawa [C, S], Paul Brumby and Kenji Yasuoka
Mechanical Engineering, Keio University, Yokohama, Kohoku-ku, Japan
takumanozwa@z8.keio.jp

Liquid-crystal phases exist as intermediate phases between those of solid and liquid. The various different types of liquid-crystal phases may be characterized by varying degrees of molecular orientational and positional order. Molecules exhibiting such phases are anisotropic in shape, with rod-like or disk-like structures being the most common. The macroscopic structure of a liquid-crystalline fluid is strongly influenced by the collective behavior of its constituent molecules. Therefore, to study these fluids at a molecular scale is very important to further our understanding of the origin of larger-scale properties, such as chirality. Under certain conditions, rod-like molecules with chiral interactions can create large-scale twisted structures. These are called chiral liquid-crystal phases and have been the subject of a lot of recent attention. There are reports of various chiral structure types, e.g. the cholesteric phase (N^*), the smectic C^* phase, the blue phase (BP I, BP II and BP III) and the twist grain boundary phase (TGB). However, to date, there is relatively little work focusing on the relationship between molecular chirality and these high-dimensional structures. In this research, Monte Carlo simulations were performed to investigate the phase transitions of chiral liquid-crystals. In order to describe chiral liquid-crystal molecules, we use the chiral Gay-Berne potential developed by R. Memmer[1].

References

[1] R. Memmer, H-G. Kuball and A. Schonhofer, *Liq. Cryst*., **15**, 345 (1993).