Chapter 7

Outlook

The field of liquid crystal elastomers and gels has typically been dominated by polymer and liquid crystal scientists with a physics background. This has led to a deep understanding of the molecular basis for nematic rubber elasticity, but at the same time advanced chemical methods for producing liquid crystal networks have not been fully employed. It is my belief that obtaining a complete physical understanding of liquid crystal-polymer materials can only be achieved with a stronger effort from scientists interested in constructing well-defined elastomers and gels. Fortunately, more recent work, including the work described in this thesis, has taken a closer look at the chemical details in liquid crystal elastomers and gels [1, 2, 3, 4, 5]. Much remains to be explored. For example, compared to nematic elastomers, much less is known about elastomers and gels with higher order phases, such as the chiral smectic C^* phase – presumably due to the difficulty in producing, aligning, and characterizing smectic networks. Light-induced changes in liquid crystal elastomers and gels have only recently been explored, and future efforts can focus on producing a faster and more controlled response [5, 4]. Other effects, such as the flexoelectric effect in liquid crystals, have not yet been incorporated into liquid crystal elastomers or gels [6]. Future work will undoubtedly tackle these challenges and, with some luck, produce liquid crystal-polymer materials with technologically viable properties.

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