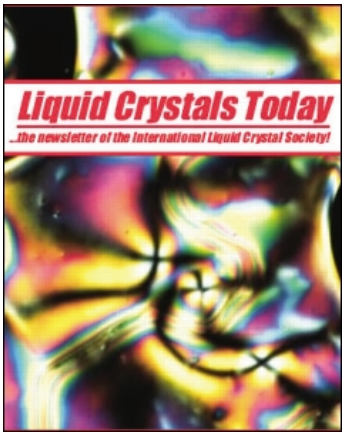

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A review of: "Liquid Crystal Dispersions"

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BOOK REVIEW
Liquid Crystal Dispersions

Paul S. Drzaic
World Scientific, 1995,
ISBN 981 02 1745 5

Review by
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It is difficult to think of a better author to provide an overview of Liquid Crystal Dispersions than Paul Drzaic. He has provided an authoritative contribution to this topic for many years and this longer review of the subject, together with Paul's insights are a most welcome addition to his contributions. The book of over 400 pages is written in a distinctive style that attempts to pull this very diverse topic together. So as to help non-specialists understand each topic, an introduction, within each chapter, covers the necessary background on specialist topics (i.e. polymers) and introduces the concepts involved. While this is intended to be helpful, it does mean that the text digresses from the main topic a little and keeping these 'digressions' under control could be somewhat difficult – just how much does one assume the reader does not know and needs to know! Of course, one is not compelled to read these sections so, on balance, I suspect they will be found useful. They are indicative of the desire the author has to ensure that readers understand the topics more fully.

The history of PDLC has been the subject of patent discussion and is summarized in Chapter 1. This also has an introduction to the wide scope of the book which covers, more or less, all LC types which are dispersed in, or have dispersed in them, polymers or inorganic materials. However PDLC (and NCAP) and 'polymer networks' are the major topics.

There are numerous ways to make a liquid crystal dispersion and, while most of them start with a fluid mixture that can be coated or filled into cells, the routes to solidifying this are varied. Chapter 2, on Recipes, introduces polymers and provides many methods to make LC dispersions by a variety of methods (NCAP, PIPS, SIPS, TIPS, PN). However, it does more than the title suggests. Around each recipe, which is taken from the open literature, there is an in-depth analysis of the technique. Some sol–gel and porous films are also noted. The importance of film thickness, droplet size and liquid crystal solubility in the polymer matrix and how they affect film performance is extensively reviewed and explained. Finally the complex subject of phase separation in PIPS systems is described.

Chapter 3 begins as do all the chapters, with a quotation – in this case from Lewis Carroll's *Through the Looking Glass*: 'It seems very pretty' she said when she had finished it, 'but it's rather hard to understand...'. This very nicely opens the chapter on nematic configurations within droplets. This topic has occupied, and probably will continue to occupy, the time of many people because it can provide an insight into the operation of PDLC films. This chapter introduces the concepts of elastic properties and defects in nematic LCs and extensively explores the rich literature devoted to the possible configurations of the LC within a droplet.

PDLC films are of interest because, under the influence of an electric field, some optical properties change. Within Chapter 4 the light scattering from a PDLC film is analysed and methods of measurement, haze, scattering profiles, etc described. While no general theory for light scattering in small anisotropic droplets exists, several approximations are reviewed. Within this chapter are gathered together many of the features that are important in order to assess this technology – response times, voltages, hysteresis, etc plus a consideration of dyed nematic, cholesteric and chiral smectic phases in PDLC films. This is a most interesting and extensive chapter.

'It is a very sad thing that nowadays there is so little useless information' (Oscar Wilde) provides the apt quotation for the final chapter on applications. A comparison with TN devices is perhaps a little more biased towards PDLC than reality suggests. The use in architectural applications and the relevant properties – opacity, haze, energy control – are reviewed. The use of PDLC films in projection displays (together with an introduction to projection active matrix display electronics) is described, taking the reader through the considerations required to provide a complex projection display. Direct view displays can be of a direct scattering or dichroic dye type – both are discussed. One criticism of PDLC films is the inability to multiplex address them because they do not have steep voltage transmission curves. However certain cholesteric dispersions possess a large hysteresis loop or bistability which allow multiplex addressing. Finally a miscellany of applications is given.

Very little work on PDLC films is omitted. The many references are used to aid the explanations given by the author – this is not a list of who has done what. When some background information (which may not be well known) is required to understand a concept, it is usually provided. If you want to make a PDLC film and have some understanding of what you are doing, or want to assess the technology for a particular application, or have a desire to study liquid crystals in confined spherical droplets or know more about what PDLC films are used for, then this is a book for you! It comprehensively covers PDLC (and more).

One slight negative comment, it was sometimes difficult to find again information read a day or two earlier; each chapter overlapped and, with only 5 chapters and each chapter having a lot of 'lateral thinking' topics within it, it was not always obvious where to look for something. The index could have been segmented a little more to aid this process. However this is a minor problem and does not prevent me from wholeheartedly recommending this book to both beginners and specialists. It is very well researched and clearly written for all levels of expertise.