

This article was downloaded by: [Tomsk State University of Control Systems and Radio]
On: 23 February 2013, At: 03:11
Publisher: Taylor & Francis
Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Molecular Crystals and Liquid Crystals

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/gmcl16>

Reflectance, Transmittance and Color Gamut of superimposed Layers of Cholesteric Liquid Crystals

David M. Makow^a

^a Division of Physics, National Research Council of Canada, Ottawa, K1A 0R6, Canada
Version of record first published: 14 Oct 2011.

To cite this article: David M. Makow (1981): Reflectance, Transmittance and Color Gamut of superimposed Layers of Cholesteric Liquid Crystals, *Molecular Crystals and Liquid Crystals*, 68:1, 301-301

To link to this article: <http://dx.doi.org/10.1080/00268948108073571>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.tandfonline.com/page/terms-and-conditions>

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae, and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand, or

costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

Reflectance, Transmittance and Color Gamut of Superimposed Layers of Cholesteric Liquid Crystals†‡

DAVID M. MAKOW

Division of Physics, National Research Council of Canada, Ottawa K1A 0R6, Canada

(Received August 8, 1980)

The spectral reflectance curves of superimposed layers of cholesteric liquid crystals (CLC) having the same handedness add as there is little absorption. The peak reflectance of the sum cannot exceed 0.5 and the transmittance cannot be less than 0.5, which is the theoretical limit. The shape of the reflection and transmission band resembles rectangles and thus can be compared with the spectral curves of optimum colors. The chromaticity loci of CLC colors and its luminous reflectance equals 0.5 of the value of the luminous reflectance attached to the optimum colors. The color gamut thus produced can be shown to be greater than that which has been obtained with pigments.

A significant improvement can be obtained using superimposed layers of CLC having opposite handedness. Their spectral curves add and the peak reflectance is not limited by the value of 0.5 but approaches 1.0. Use of CLC's of opposite handedness is not always practical as they have different chemical and physical properties. A similar result can be obtained using two CLC layers of the same handedness and a half-wave retardation plate interposed between them. This plate converts the transmitted through the upper layer right-handed (left-handed) component into a left-handed (right-handed) one, which is then reflected from the lower layer and contributes to the reflected left-handed (right-handed) component from the upper layer. The chromaticity loci and color gamut of such superimposed CLC pairs of coatings now approaches that of optimum colors of the same luminous reflectance.

† A major portion of this paper was published by the author in *Applied Optics*, Vol. 19, p. 1274, April 1980.

‡ Presented at the Eighth International Liquid Crystal Conference, Kyoto, July 1980.