



DATA SHEET

SINGLE COLOR CHOLESTERIC LIQUID CRYSTAL MIXTURES FOR THE PERSONAL CARE INDUSTRY

ABOUT LCR/HALLCREST

LCR Hallcrest has been a leading formulator and microencapsulator of cholesteric liquid crystal (CLC) mixtures for more than 25 years. The Company was a pioneer in the use of CLC mixtures as ingredients in skin care cosmetics in the late 1980s and has supplied the international personal care industry with an increasing range of novel raw materials based on its proprietary technologies since this time.

CHOLESTERIC LIQUID CRYSTALS (CLCs)

Liquid crystals are materials which exhibit the properties of both crystalline solids and isotropic liquids. There are many different types of liquid crystal and LCR/Hallcrest's expertise is centered on one particular type called thermotropic CLCs. The Company's main use for these materials is as the principal components in its wide range of color-change temperature indicating products. However, these unique materials also possess a range of attributes that make them ideal for use in the personal care industry.

LCR/Hallcrest's CLC mixtures are novel oily blends of cholesteryl esters which have been carefully formulated to produce an optimized range of visual effects across the full color spectrum. The most striking property of these materials is their characteristic opalescent/iridescent appearance which results from their ability to selectively reflect visible light. In addition to being able to impart special aesthetics, CLC mixtures exhibit an occlusive emolliency on the skin and have also been used to deliver and stabilize lipophilic actives (e.g vitamins). CLCs are essentially oils which are soluble in other oils and esters but insoluble in water and propylene glycol. The addition of other lipophilic components to a CLC mixture will reduce its clearing point and can also significantly affect its visual appearance. Flavors/fragrances and dyes/pigments can also be added.

LCR/Hallcrest manufactures a wide range of CLC mixtures and those referred to in this data sheet are representative examples of the types of product available. Products can be tailor-made to customers' requirements.

SINGLE COLOR CLC MIXTURES (UC Series)

There are two principal variables that are used to modify the properties of these types of mixtures. They are:

- 1) The color (of light reflected by the LC).
- 2) The clearing point (the temperature above which the mixture ceases to show liquid crystal properties - the cholesteric LC to isotropic liquid transition temperature).

Single color CLC formulations can readily be made which reflect light of any color (band of wavelengths), and which have clearing points from ambient temperatures 25°C (77°F), to in excess of 70°C (158°F). It is also possible to control viscosity and specific gravity within limits.

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STANDARD MIXTURES

A range of standard single color CLC mixtures has been developed, reflecting, respectively, red (#UC10), green (#UC30) and blue (#UC40). These have clearing points between 50-55°C (122-131°F). Mixtures showing orange (#UC20) and violet (#UC50) are also available, as is a special "silver" mixture (#UC60) which reflects in the IR region. Product specifications are available for all six standard mixtures.

These standard mixtures are all intermiscible to give intermediate colors, while keeping the clearing point fixed. (For example, by mixing the red and violet together it is possible to make the orange, green and blue.)

HIGH CLEARING POINT MIXTURES

The importance of the clearing point increases if other oily (non-CLC) materials are to be added to the CLC mixture. Lipophilic "actives" (usually vitamin mixtures) can be added to CLC mixtures in small percentages, as can other additives that modify physical properties, like surface tension, specific gravity and viscosity. There is a general rule on addition of these types of non-CLC oily materials that for each 1% added, the clearing point of the resultant mixture is depressed by 2-3°C. Formulating a CLC host with a higher clearing point can compensate for this. A range of mixtures with clearing points in the range 60-70°C (140-158°F) is available. These high clearing point mixtures are intermiscible in the same way as the standard mixtures.

CUSTOM MADE MIXTURES

- a) Color and Clearing Point - LCR will be happy to custom formulate LC mixtures to customer requirements. Color and clearing points need to be specified. Ideally, a sample should be provided for color matching.
- b) Composition, Viscosity and Specific Gravity - It is possible to formulate a single color CLC mixture with a minimum clearing point in many different ways. A variety of component chemicals can be used, and in differing percentages. By varying the composition, it is also possible to control both the viscosity and specific gravity within limits.
- c) Additives - Non-CLC oily materials – essential oils, vitamins, preservatives and dyes/ pigments can also be incorporated into CLC mixtures to customers' requirements.

Please contact us for more information.

STORAGE

CLC mixtures should be stored in tightly closed containers at normal ambient temperatures (15 - 30 °C; 60 - 85 °F)

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