



**Evaluation of Emulsun<sup>®</sup> for  
Liquid Crystal Structure**

**Application Report  
AR-010**

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## **1. Summary**

The sunflower-derived monoglycerides and polyglyceride esters of Emulsun<sup>®</sup> form a synergetic crystalline structure that can create microemulsions. The specific combination of the hydrophilic and hydrophobic structures in Emulsun generates a self-assembling hexagonal liquid crystal phase with oil in water formulations that can be witnessed during cooling. Emulsions that form liquid crystal structures are known to have better stability and provide better moisturization.

This study evaluated a standard emulsion with a known liquid crystal structure, and compared it to the same formula containing Emulsun, in order to demonstrate the ability of Emulsun to form a liquid crystal structure. Images of said emulsions were captured utilizing a microscope under cross polarization.

Under the conditions of the study, Emulsun was able to create the same hexagonal liquid crystal phase as the standard emulsion with a known liquid crystal structure.

## **2. Title**

Evaluation of Emulsun for Liquid Crystal Structure

## **3. Objective**

The objective of this study was to evaluate Emulsun for its ability to form a liquid crystal structure emulsion type.

## **4. Investigative Organization**

Arizona State University  
Eyring Materials Center  
Tempe, AZ

## **5. Sponsor**

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## **6. Schedule**

Study Dates: December 2018

## 7. Test Articles

The following vehicle was utilized (%wt./wt): Water (76.30), Mineral Oil (5.00), Dimethicone (5.00), Glycerin (5.00), Caprylic/Capric Triglyceride (3.00), Emulsifier (3.00), Stearyl Alcohol (2.00), and Preservative (0.70) (pH ~ 6 / homogenize for 3-5 minutes at 75-80°C then mix with moderate propeller agitation while cooling to 50-55°C). Emulsifier = Emulsun or Standard (C14-22 Alcohols (and) C12-20 Alkyl Glucoside).

**Table I. Test Articles**

<b>Floritech Lab Code</b>	<b>Description</b>
A	Vehicle + 3% Emulsun (Emulsun)
B	Vehicle + 3% C14-22 Alcohols (and) C12-20 Alkyl Glucoside (Standard)

## 8. Procedure


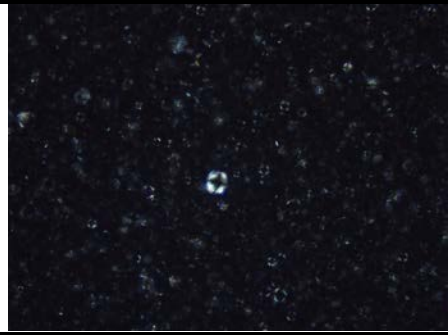
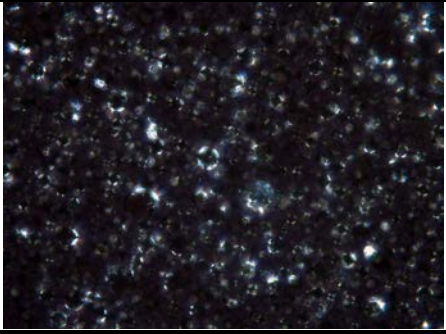
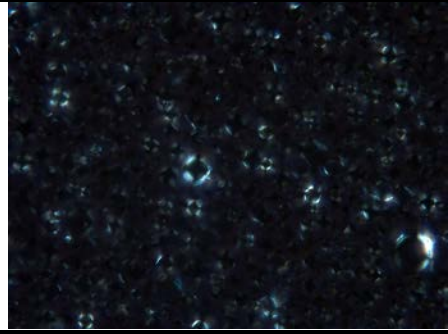
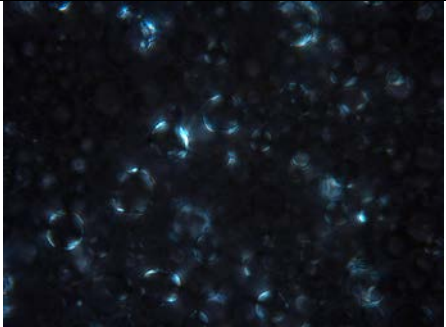
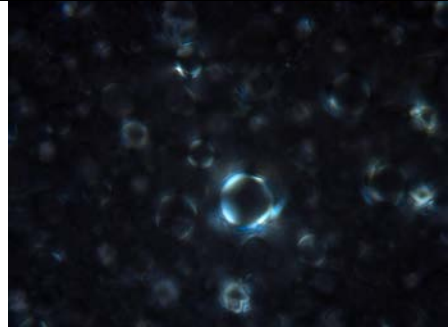
Images were captured using an optical microscope with cross polarized light (Nikon Optiphot-Pol microscope). Polarization was at 90°; color correction was done with camera software (JENOPTIK ProgRes CapturePro 2.10.0.0); and images were enhanced with Photoshop.

Formulation and captured images were done in accordance with Zhang W and Liu L. Study on the Formation and Properties of Liquid Crystal Emulsion in Cosmetic. *Dermatological Sciences and Applications* 2013; 3: 139-144 ([https://file.scirp.org/pdf/JCDSA\\_2013061315451746.pdf](https://file.scirp.org/pdf/JCDSA_2013061315451746.pdf)).

## 9. Results

The photos in Table II show each test article under the notated magnifications (*i.e.* #X) with 90° cross polarization (pol), and the width of the image captured.

**Table II. Polarized Emulsion Images**

Microscope Conditions	Test Article A (Emulsun)	Test Article B (Standard)
20X-pol, 700 μm wide		
40X-pol, 350 μm wide		
100X-pol, 140 μm wide		

The photos in Table II show the hexagonal liquid crystal phase that forms within the emulsions for both Test article A (Emulsun) and Test Article B (Standard).

## 10. Conclusions

Emulsun was able to create the same hexagonal liquid crystal phase as the standard emulsion with a known liquid crystal structure.

## 11. Signatures

\_\_\_\_\_  
Tiffany Quinn, M.S., C.C.R.C.  
Director of Clinical Services

\_\_\_\_\_  
Date

\_\_\_\_\_  
Ryan Quinn, M.S.  
Quality Assurance

\_\_\_\_\_  
Date