

RHEOLOGICAL STUDIES OF A COSMETIC MULTIPLE EMULSION

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ABSTRACT

For the first time Seifriz in 1925, reported the existence of multiple-type dispersion during the phase inversion of ordinary emulsions. The term "multiple emulsions" was then recognized as the two liquid phases separated by another immiscible liquid layer. Becher, 1965, described water-in-oil-in-water (w/o/w) emulsions in his book as "an emulsion in which both types of emulsions exist simultaneously". This means that an oil droplet may be suspended in an aqueous phase, which in turn encloses a water drop, thus giving a w/o/w emulsion. Several processes are used for the manufacture of multiple emulsions. The most widely used procedure is two step method (Raynal et al.,1993 and Silva-Cunha et al., 1997). The 1st step consists of preparing a primary emulsion. In the 2nd step, a definite amount of this primary emulsion is dispersed in an external phase containing the secondary emulsifier . Although it is a simple method, the 2nd step of the procedure includes many critical factors. In this study a cosmetics W/O/W multiple emulsion (Formulation) was prepared using macadamia nut oil. Vitamin C was added in the internal phase and Lipacide PVP® was added in the oily phase. A base formulation without active ingredients was also prepared. Both the formulation were kept at different conditions and rheological studies were performed after 3 months and after 6 months. It was noted that viscosities of different samples of base cream were decreased with the passage of time upto 3 months but there was a trend of increase in viscosities after 6 months. Viscosities of different samples of formulation were increased at most of the conditions except at 4°C. However there was decrease in viscosities of all the samples of base and of formulation with the increase of shear stress.

KEY WORD: Multiple emulsion, Viscosity, Rheology, Shear thinning, Thixotropy,

INTRODUCTION

The term "multiple emulsions" is recognized as the two liquid phases separated by another immiscible liquid layer. Becher,1965 described water-in-oil-in-water (w/o/w) emulsions in his book as "an emulsion in which both types of emulsions exist simultaneously". This means that an oil droplet may be suspended in an aqueous phase, which in turn encloses a water drop, thus giving a w/o/w emulsion. Each parameter of the two emulsification procedure has an influence on the characteristics of the system. In the manufacture of a w/o/w multiple emulsion, the 1st emulsification step involves the requirements which are the same with all other w/o emulsions, such as a high manufacturing temperature, i.e. 70-80°C, a

high agitation speed, usually above 1500 rpm, with a high powered mixer for about 20 to 35 minutes until complete cooling to ambient temperature (Raynal et al., 1993).

During the 2nd manufacturing step, in order to avoid the breakdown of the oil droplets, some precautions have to be taken. The introduction of the primary emulsion into an aqueous emulsifier solution should be carried out at ambient temperature and should be slow and progressive, the manufacturing speed should be relatively low. After the complete introduction of the primary emulsion, the stirring should be continued for at least 10-30 minutes at a low speed of 200-800 rpm for the homogenization of multiple emulsion.

Due to the structure of multiple emulsions, they can offer promising applications in