

TAG CRYSTALLIZATION IN EMULSIONS : DSC/XRDT STUDY OF TRIACYLGLYCEROL POLYMORPHISM INFLUENCED BY EMULSIFIER CONCENTRATION

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Characterization of crystallization behavior of fats within emulsion droplets of oil in water emulsions -of pharmaceutical and agronomic interest- is the main focus of this research.

Due to the multiplicity of components added – proteins, hydrocolloids and other surfactants - which are all susceptible to influence the emulsions' crystallization behavior - investigation of emulsions can be difficult [1,2,3].

Triglycerides (TAGs), the main constituents of fats, exhibit a complex monotropic polymorphism that frequently forecloses the study of thermal and structural properties of the fats. In that case one has to choose simple adequate models for the study. We choose a model only containing Sodium Caseinate (SC), hydrogenated vegetable fat and one lipid emulsifier in our model emulsions. In that model only two polymorph forms of α and β' types are subsequently formed upon cooling and are evidenced dependant on the samples time temperature history and protein concentration [3,4,5]. Regarding the supposed heterogeneous crystallization mechanism they should also depend on the fat globule interface [6,7].

Small and Wide Angle X-ray Diffraction as well as DSC are used to investigate the thermal and structural properties of emulsified lipids. In the case of real emulsions investigation is not only a question of complexity but also a question of concentration of the lipid phase.

We monitor thanks to flux of Elettra BL 5.2 differences in the crystalline structure of the emulsified fat depending on the lipid emulsifier concentration (within variation of 0.05%) going along with change of the onset temperature. This should be taken for an indication that in a model emulsions containing only SC and Propylenglycol monostearate (PGMS) the nucleation step for the primary nucleation is heterogeneous and depends on the interface composition. Furthermore we are able to distinguish difference in the crystal polymorph and the stability of the latter going along with DSC measurements.

References:

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