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Structure formation in oleic acid – sodium oleate based oleogels

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The structuring of liquid oil into what are known as oleogels has received considerable attention in recent years. Oleogels have the potential to replace solid fat in food products with healthier unsaturated oils. Various oleo-gelators are known, ranging from large polymers to low molecular weight oleo-gelators (LMWOG). A known combination of LMWOGs is that of oleic acid and sodium oleate. Their ability to gel sunflower oil has already been demonstrated, and gel strength can be tuned by varying the ratio between oleic acid and sodium oleate. The addition of a small amount of water results in stronger gels and suggests hydrogen bonding plays a role in the gelation.¹

In this presentation we will dive deeper into the relation between the gel strength of oleogels prepared with oleic acid and sodium oleate, and their micro- and nano-structure. Oleogels were prepared with different ratios of the two LMWOGs and using different triglyceride oils. Upon varying the ratio between oleic acid and sodium oleate, changes in both micro- and nano-structure were observed through light microscopy and Small Angle Neutron Scattering (SANS) and Ultra-SANS (USANS). The observed structure ranges from inverse micelles to lamellar crystals, which coexist in some cases. Additional information on the type of crystals was collected using Small Angle X-ray Scattering. In addition to the triglyceride oils, n-hexadecane was used as a solvent analogue. This enabled the use of selective deuteration and provided additional information on the nano-structure. A clear relation between micro- and nano-structure, and the strength of the oleogel was observed.

References:

1. RSC Adv.,2015, 5, 47466

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