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SYNTHESIS AND STUDIES OF OLEOGELS AS SUBSTITUTES FOR STRUCTURAL FATS

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ABSTRACT:

Trans-unsaturated fatty acids (TFA) in the diet represent a major public health problem because they increase the frequency of cardiovascular diseases. TFAs are present in many solid fats of animal origin or in margarines, resulting from the hydrogenation of vegetable oils. However, these solid fats are necessary to texture the lipid phases of food. In this context, many studies are being carried out to replace solid fats in foods. One of the most promising ways is to solidify *cis*-unsaturated oils (liquid at room temperature) by organogelators. These small molecules gel solvents at low concentrations, typically a few percent by weight,[1,2] self-assembling into a solid 3D network in oil. Organogelators capable of gelling edible oils are called oleogelators. Examples of oil gelators are easily found in the literature, but for food applications, they must be without adverse effects when taken orally. In the present work we have synthesized *N*-Palmitoyl-L-phenylalanine because this compound is endogenous i.e. naturally present in the body and we have tested it as gelators of rapeseed oil. We have studied the thermodynamic properties of the gels formed with it by micro differential calorimetry (µ-DSC), and their mechanical properties as a function of temperature. From these measurements, we mapped out the *c-T* phase diagram. This compound showed two polymorphs that correspond to two kinds of gels, and led to a gel-to-gel transition in addition to the classic sol-to-gel transition. The structures of both polymorphs have been investigated by cryo-SEM, WAXS, and FTIR, and were correlated with thermal and mechanical behaviour.

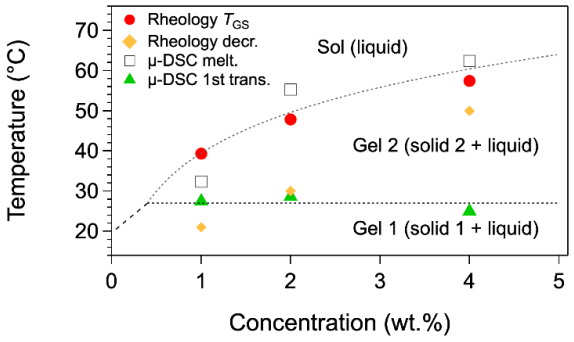

Figure 1: c-T phase diagram of Palmitoyl-L-phenylalanine/rapeseed oil; heating rate: 0.25 °C.min^{-1}

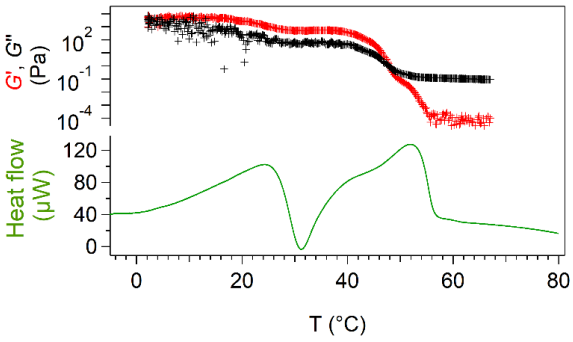

Figure 2: Elastic and viscous moduli of palmitoyl-L-phenylalanine/rapeseed oil (2 wt. %) as a function of T and thermograms upon heating (rate: 0.25 °C.min^{-1}).

References

1. R. G. Weiss, Ed., *Molecular Gels: Structure and Dynamics*, Royal Society of Chemistry, Cambridge, 2018.
2. R. G. Weiss, *J. Am. Chem. Soc.*, 2014, 136, 7519–7530.