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S E M I N A R
on
Semiconductor Physics and Nanotechnology

Mo, 02.12.2024, 11:15 Uhr,

Seminar in
person in the Physics lecture hall *or* via Zoom

"Nanostructured Materials by Molecular Self Assembly"

Prof. Dr. Otto Glatter

Institute of Inorganic Chemistry, Graz University of Technology, Austria

Glycerolmonolinolein (MLO), Glycerolmonoolein (GMO), Phytantriol (PT) and a few other lipophilic molecules self-assemble in bulk in presence of water to form well defined liquid crystalline phases. Their structure can be tuned by temperature variation and/or by addition of oils or other ingredients. This leads to gel-like or fluid systems with a large internal interface between water and oil domains with different viscosities.

These nanostructured phases can be dispersed in the excess water phase by addition of an external stabilizer and energy input leading to internally self-assembled particles, so-called Isasomes (O/W emulsions) [1-5]. These Isasomes are potential carrier systems for hydrophilic, amphiphilic and lipophilic functional molecules, but similar structures are also formed in the intestine during digestion of fat [6]. Their internal nanostructure can be best characterized by SAXS, supported by polarization spectroscopy, while particle sizes are usually determined by dynamic light scattering (DLS) and Cryo-TEM.

Mixtures of Isasomes with different nanostructures can be used to study lipid transport between Isasomes [7]. The high viscosity of the liquid crystalline phase can be used to produce stable, nano-structured W/O emulsions without any stabilizer [8].

Finally, we can form reverse hexosomes existing of a hydrophilic liquid crystal dispersed in an oil like alkane [9] and even in bio-compatible oils [10].

All these systems have a great potential as delivery systems for functional molecules in very different fields like pharmaceutical and cosmetic applications, food science and agro-chemistry.

References

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[2] A. Yaghmur, et al., 2005 *Langmuir* **21**, 569. Emulsified Microemulsions and Oil-Containing Liquid Crystalline Phases
[3] A. Yaghmur, et al., 2006 *Langmuir* **22**, 517. Oil-Loaded Monolinolein-Based Particles with Confined Inverse Discontinuous Cubic Structure (Fd3m)
[4] A. Salonen, et al., 2008 *Langmuir* **24**, 5306. Dispersions of Internally Liquid Crystalline Systems Stabilized by Charged Disklike Particles as Pickering Emulsions: Basic Properties and Time-Resolved Behavior
[5] F. Muller, et al., 2010 J. *Colloid and Interface* Sci. 342, 392. Phase behavior of Phytantriol/water bicontinuous cubic *Pn3m* cubosomes stabilized by Laponite disc-like particles
[6] S. Salentinig et al. 2011 *Soft Matter* **7**, 650. Transitions in the internal structure of lipid droplets during fat digestion
[7] Ch. Moitzi, et al., 2007 *Adv. Materials* **19**, 1352. Phase Reorganization in Self-Assembled Systems Through Interparticle Material Transfer
[8] Ch.V. Kulkarni, et al., 2010 *Soft Matter*, **6**, 5615, Water-in-oil nanostructured emulsions: towards the structural hierarchy of liquid crystalline materials
[9] F. Pirolt, et al., (2018), *Langmuir*, **34**, 8379. “Reverse-Hexosome Dispersions in Alkanes – The Challenge of Inverting Structures”
[10] F. Trummer, et al., (2022), *Nanomaterials*, **12**, 01133. Inverse ISAsomes in bio-compatible oils – Exploring formulations in squalane, triolein and olive oil

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Zoom – Link:
https://zoom.us/j/96375934537?pwd=RTlKTWhSdzRHU211YTY1bGFxTUtpZz09
Meeting-ID: 963 7593 4537
Kenncode: =r=4YQ