Hierarchically Organized Nanostructured Lipid Materials

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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. 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 [1-6]. 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 [7].

The hierarchical structure can be extended to a next level by gellifying the continuous aqueous phase by the addition of polymers like κ–Carrageenan or Methylcellulose. This leads to a new type of hydrogel, loaded with ISAsomes [8-9].

These gels can even be dried into foils and re-dispersed on demand. During drying, the nanostructure is lost, but upon re-hydration it forms again within a few minutes. Even the emulsion droplets survive the drying and re-hydration process [10].

Finally, we can use the oil-continuous bulk phase to create concentrated, stable water-in-oil emulsions having a paste-like consistency with a water content of up to 90% by volume. These dense emulsions, also called bi-liquid foams do not need the addition of a stabilizer [11].

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.

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