About Monodisperse Polymer Foams And Gelled Complex Fluids

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Part I Monodisperse Polymer Foams

Combining the concept of ***emulsion templating*** with ***microfluidics*** we generated ***monodisperse, highly-ordered polymer foams*** with specific morphologies. Surprisingly, the polymerization of the same monodisperse emulsion template leads to completely different morphologies if one changes the locus of initiation. ***Monodisperse open-cell foams with spherical pores*** are obtained if one initiates the polymerization from the bulk phase. ***Monodis-perse closed-cell foams with honeycomb structures*** are obtained if one initiates the polymerization from the oil/water interface. In order to explain the differences in ***pore shape and connectivity*** we propose that an ***osmotic transport*** redistributes matter in the case of interface initiation, while this does not happen in the case of bulk initiation. Being able to control very precisely the morphology of a polymer foam opens up a new arena for the ***development of lightweight materials with optimized mechanical properties***.

Part II Gelled Complex Fluids

Typical examples of complex fluids are micellar solutions, lyotropic liquid crystals, thermotropic liquid crystals, microemulsions, and emulsions. A gel, on the other hand, consists of a gelator and a solvent and can be defined as a dilute cross-linked system which exhibits no flow in the steady state. The unique selling point of **gelled complex fluids** is the fact that the two coexisting structures can take over two different functions. Gelled complex fluids are **soft materials** in which the **microstructure of the complex fluid** is combined with the **mechanical stability of a gel**! To obtain a gelled complex fluid one either adds a gelator to a complex fluid or replaces the solvent in a gel by a complex fluid. The most prominent example of a **„natural" gelled complex fluid is the cell**. There are various strategies via which one can form a gelled complex fluid one of which is **orthogonal self-assembly**, i.e. the **independent but simultaneous formation of two coexisting self-assembled structures** within one system. This contribution aims at describing the structure and potential applications of various gelled complex fluids and at clarifying whether the respective system is formed via orthogonal self-assembly. For this purpose, previous as well as **current research activities** will be presented and future perspectives will be addressed.