

## Wormlike micelles under shear – An experimental and theoretical approach

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Within the past decades the self-assembling processes and the rheological properties of elongated (wormlike) micelles have attracted a lot of interest [1,2]. Due to the fact, that elongated micelles are very flexible on the one hand and on the other hand have the ability to break and reform after being exposed to high shear forces, it is evident that they reveal a unique viscoelastic behaviour. The first experiments done by Rehage, Hoffmann and coworkers demonstrated that this unique behaviour results in a highly nonlinear flow curve [3]. Especially for the rheological properties of wormlike micellar systems the length and the thickness of the micelles as well as the degree of branching are critical parameters. To tune them, either the molecular composition can be changed, e.g. through the usage of different alkyl chain lengths, or by using counterions stabilizing the formed structures.

Within our project we determine the impact of changing the structure of wormlike micelles by using biosurfactants such as oleic, gonic or erucic acid, which belong to the class of omega-9 fatty acids, and mixing them for instance with octyltrimethylammoniumbromid (OTAB). In this series of fatty acids the length of the alkyl chain is systematically increased, yielding thicker wormlike micelles which changes the stiffness of the micellar system. However, at the same time it is also possible that branching occurs, which will substantially alter the properties of the micelles. By changing the molecular ratio and the concentrations the systems rheological behaviour becomes altered due to changes in the degree of branching and entanglement. The such obtained data are then compared to a previously studied theoretical model [4,5], linking the mechanical level, expressed through the viscoelastic stress, to a structural variable, that is the length distribution of wormlike micelles in the sample. From this comparison a predictive understanding of such complex self-assembled systems is gained.

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