Colored Soaps for PhotoChemical and PhotoPhysical Applications

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In organic solar cells (OSCs) and organic light emitting devices molecular order and orientation essentially determines device performances. Particularly, in OSCs the rather random orientation of electron donating and accepting molecules causes a very complex morphology of the active layer which hampers understanding of photo-generation of free charge carriers. Hence, to push basic research forward and to produce photonic layers with well-defined anisotropic properties model systems with unique molecular orientation are desired. Such systems might be constituted by amphiphilic molecules as inspired by surfactant chemistry.

In this contribution we will show electron donors and electron acceptors as well as exceptional fluorophores, which were functionalized to yield amphiphiles. Thin films of these amphiphiles were produced prevailingly by means of the Langmuir-Blodgett and spin-casting technique. Thus, smooth homogeneous films as well as vesicles and fibers can be produced, which differ markedly in their light absorption and electric properties. Exemplarily, strong changes of the absorption spectra with aggregate growth are shown in the figure below. Furthermore, molecularly thin films with a narrow angular distribution of chromophore orientation were produced. Thus, finally the concepts of surfactant chemistry could be successfully transferred to photonics.