**Project 3.7. Dynamic and responsive 2D systems**

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**Background**:
There are at least two aspects of self-assembly that are extremely inspiring: first, all forms of life are self-assembled systems and so, understanding self-assembly processes could give us better understanding of life itself. Second, the apparent ease with which self-assembly can construct complex structures from simple components spurs imagination for the modes of "autonomous" fabrication or manufacturing. Self-assembly couples chemical/physical properties of individual parts, which gives rise to multi-functional materials. The real difficulty is in that the "parts" need to be precisely designed and appropriately "programmed" (also by external stimuli) to come together in correct orientations. Self-assembly outside of equilibrium – DySA might be a mean to create life-like, reconfigurable, and "intelligent" materials and systems.
Very little was done on utilization of DySA in Langmuir and Langmuir-Blodgett films. Dynamic changes within Langmuir films directly at the air/water interface are usually imposed due to the mechanical compression. The proposed project aims at adding another layer of complexity by applying other external stimuli, which will affect the films. This will further expand the applicability of Langmuir and Langmuir-Blodgett methods by introducing dynamic and out-of-equilibrium DySA approaches. 2D setup allows for further understanding of the rules governing this phenomenon, mainly thanks to simpler (comparing to 3D systems) mathematical description.

**Aim**:
Assemblies of nanoobjects usually need to be supported by solid substrates. However, anisotropy of the surface and interactions with the underlying lattice determine and restrict the possible structures. Formation of assemblies at the anisotropic surface of water, driven only by the properties of the involved objects is crucial for understanding rules governing self-assembly. The project aims to investigate reconfigurable Langmuir-Blodgett films upon application of external stimuli (including light, sound, electromagnetic fields).

**Requirements:**
The project combines essential methods of physical chemistry, nanotechnology and organic synthesis. The successful candidate is expected to show scientific initiative, perform experiments independently, plan the workflow, maintain research notes and participate in the decision making process. He/she will need to build experimental setups, calibrate them, plan and perform control experiments and analyze the data. Contribution through regular reporting and publishing, taking part in and presenting at group meetings and conferences is mandatory.

The background in chemistry and nanotechnology would be appropriate. However, applicants with backgrounds in related fields will be also considered based on the possible input to the project (e.g. physicists, engineers or similar).
Ability to work independently as well as in a group and proficiency in English speaking and writing are required. Successful candidate is expected to contribute to the efficient functioning of the lab by providing help and supervision to junior members of the group and by fulfilling necessary administrative and organizational tasks.