

Project 4.6 Self-assembly of active droplets onto substrates (theoretical)

Supervisors: dr hab. Panagiotis Theodorakis

Institute: IFPAN

Unit: ON5.5

www: <https://sites.google.com/view/theodorakisgroup/home>

Background:

Active matter consists of self-driven entities that can spontaneously form complex patterns onto substrates, thus self-assembling into functional nanodevices. This addresses challenges of manufacturing at the nanoscale, as matter is supposed to form desired structures without defects. Moreover, external fields (e.g. light illumination) are able to alter the behavior of active matter and drive the system into different structures, which, in turn, can form different superstructures on substrates. The design of these substrates (e.g. gradient substrates), can be further used to modulate the energy flow of the active matter system and lead it into new structures.

Aim:

The project aims at exploring the self-assembly of active droplets onto substrates of various properties towards active manufacturing at the nanoscale by using computer simulation. Hence, the project explores fundamental properties of active matter and, also, aims at providing design principles that can lead to specific superstructures that depend on the choice of active droplets and the substrate.

Requirements:

- the candidates should be familiar with computer simulation methods and possess programming skills (for example, C/C++ or Python) that enable them to perform analysis of the data and use various libraries for this purpose,
- experience with molecular and mesoscale simulation models is an advantage,
- sufficient proficiency in English is required

Funding:

Scholarship: grant funding of 5000 PLN per month, before subtracting obligatory employer and employee social security contributions (~15%), for 14 months. Afterwards, standard Polish PhD scholarship (about 2360 PLN/month net in years 1-2, 3640 PLN/month net in years 3-4).

Contact: panos@ifpan.edu.pl