Contribution ID: **6** Type: **oral**

Principles of design of artifical and biological molecular engines

Tuesday, 5 September 2017 14:00 (30 minutes)

Molecular engines are based on different principles than macroscopic motors. I will present two examples: artifical engine created in our lab namely nano-wind mill driven by evaporation of water and the motion of kinesin motor walking on microtubules. This biological engine, of incredibly efficiency, is driven by thermal noise, while consumption of ATP is mainly used for detachment of its parts from microtubule. The key principle in its design is the proper synchronization of its diffusion driven by thermal noise with the hydrolysis of ATP, detachment of ADP and further attachement of ATP, as we show in our experiment. Our nano-wind mill does work due to spatial organization and synchronization of many motors, which in concerto respond to flux of water.

The presentation was supported by the National Science Centre, Poland within the grant Maestro UMO-2016/22/A/ST4/00017.

[1] K. Sozanski et al Small Crowders Slow Down Kinesin-1 Stepping by Hindering Motor Domain Diffusion, PHYSICAL REVIEW LETTERS, 115, 218102, (2015).

[2] P.Niton et al A “nano-windmill” driven by a flux of water vapour: a comparison to the rotating ATPase, NANOSCALE 5, 9732-9738, (2013).

[3] K.Sozanski et al Activation Energy for Mobility of Dyes and Proteins in Polymer Solutions: From Diffusion of Single Particles to Macroscale Flow, PHYSICAL REVIEW LETTERS 111, 228301, (2013).

[4] T.Kalwarczyk et al Motion of nanoprobes in complex liquids within the framework of the length-scale dependent viscosity model, ADVANCES IN COLLOID AND INTERFACE SCIENCE 223, 55-63, (2015).

Primary author: HOLYST, Robert (Institute of Physical Chemistry PAS)

Presenter: HOLYST, Robert (Institute of Physical Chemistry PAS)

Session Classification: Session 6