

Diffusion and freezing transition of rod-like DNA origami on freestanding lipid membranes

Eugene P. Petrov^{1*}, Aleksander Czogalla², Dominik J. Kauert³, Ralf Seidel³,
Petra Schwille¹

¹Max Planck Institute of Biochemistry, Department of Cellular and Molecular Biophysics,
Martinsried, Germany

²Biophysics, BIOTEC, Technische Universität Dresden, Dresden, Germany

³DNA Motors, BIOTEC, Technische Universität Dresden, Dresden, Germany

*petrov@biochem.mpg.de

During the last decade, DNA origami has become a powerful tool in research at the nanoscale. The relative ease of constructing functionalized DNA origami structures of a defined shape allows for their applications in membrane biophysics. Recently, we have constructed stiff rod-like DNA origami structures consisting of six DNA helices, which were functionalized with hydrophobic membrane-binding anchors and fluorescently labeled at defined positions [1]. Selective fluorescent labeling allowed us to determine the translational and rotational diffusion coefficients of the DNA origami rods on lipid membranes by fluorescence correlation spectroscopy, which were found to be in a good agreement with the hydrodynamics-based theory of membrane diffusion. Further, we studied the effect of the surface density of membrane-bound origami structures on their Brownian motion. We found a strong decrease of the translational and rotational diffusion coefficients of membrane-bound nanorods with an increase in their surface density. We compare our experimental findings with results of Monte Carlo simulations of Brownian hard needles in 2D.

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References

- [1] A. Czogalla, E.P. Petrov, D.J. Kauert, V. Uzunova, Y. Zhang, R. Seidel, P. Schwille: *Switchable domain partitioning and diffusion of DNA origami rods on membranes*. Faraday Discuss. **161**, 31–43 (2013)