

On Demand Modulation of Adhesion of Lipid Vesicles and Biological Cells on Switchable Substrates

Mittwoch, 6. Dezember 2023 17:05 (20 Minuten)

Wetting and adhesion of lipid vesicles and biological cells are distinct from that of Newtonian fluid, because of their viscoelasticity. The use of switchable substrates based on polymer brushes and hydrogels offers a unique advantage for the adjustment of interfacial interactions on demand.

In the first of my talk, I will introduce our collaborative activities with Müller group (Göttingen) within the framework of SPP2171. Here, we utilized stimulus responsive polymer brushes whose conformation can be reversibly switched by the presence of metal ions. The change in the polymer chain conformation is accompanied by the modulation of interfacial viscoelasticity and interfacial potentials [1]. We monitored the global shape of vesicles using confocal microscopy and the local height profile near the surface using micro-interferometry [2]. In addition to the regulation of vesicle shape and hence adhesion free energy under static conditions, we also monitored the change in vesicle shape caused by the dynamic change in brush conformation in situ.

In the second part, I will extend the topic and show you some examples that a very similar approach can be taken to mechanically stimulate biological cells by the use of switchable hydrogels [3].

References

- [1] aA. Yamamoto, T. Ikarashi, T. Fukuma, R. Suzuki, M. Nakahata, K. Miyata, M. Tanaka, *Nanoscale Advances* 2022, 4, 5027-5036; bA. Yamamoto, K. Hayashi, A. Sumiya, F. Weissenfeld, S. Hinatsu, W. Abuillan, M. Nakahata, M. Tanaka, *Frontiers in Soft Matter* 2022, 2, 959542.
- [2] F. Weissenfeld, L. Wesenberg, M. Nakahata, M. Müller, M. Tanaka, *Soft Matter* 2023, 19, 2491-2504.
- [3] aM. Hippler, K. Weissenbruch, K. Richler, E. D. Lemma, M. Nakahata, B. Richter, C. Barner-Kowollik, Y. Takashima, A. Harada, E. Blasco, M. Wegener, M. Tanaka, M. Bastmeyer, *Science Advances* 2020, 6, eabc2648; bM. Hörning, M. Nakahata, P. Linke, A. Yamamoto, M. Veschgini, S. Kaufmann, Y. Takashima, A. Harada, M. Tanaka, *Scientific Reports* 2017, 7, 7660; cV. Frank, S. Kaufmann, R. Wright, P. Horn, H. Y. Yoshikawa, P. Wuchter, J. Madsen, A. L. Lewis, S. P. Armes, A. D. Ho, M. Tanaka, *Scientific Reports* 2016, 6, 24264.

Hauptautor: TANAKA, Motomu

Vortragende(r): TANAKA, Motomu

Sitzung Einordnung: Short Talks