Studying Pharmaceutical Nanoparticles by Atomic Force Microscopy

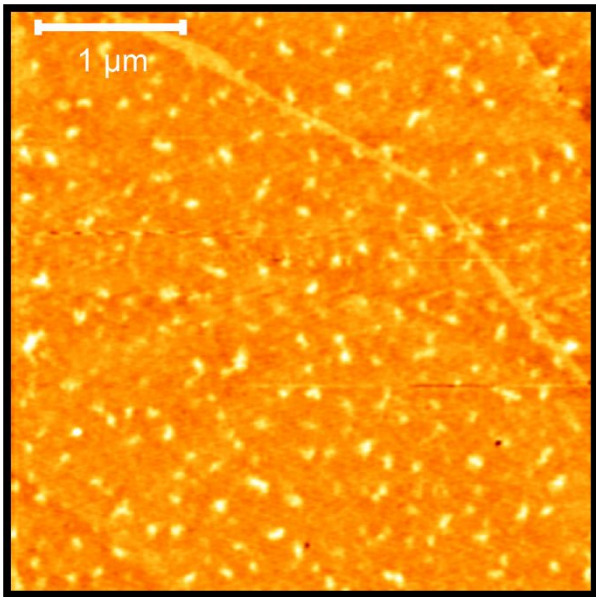
Henrik Siboni[1,2], *Andreas Zimmer*[2], *Leonhard Grill*[1]

[1] *Single-Molecule Chemistry, Institute of Chemistry, University of Graz*
[2] *Pharmaceutical Technology & Biopharmacy, Institute of Pharmaceutical Sciences, University of Graz*

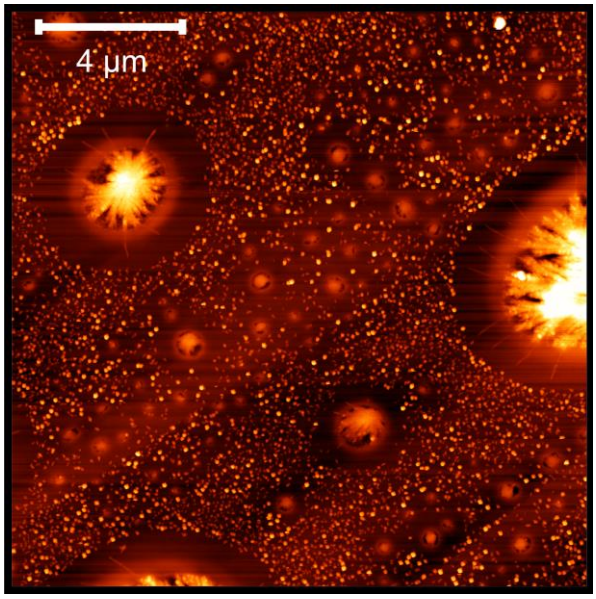
Nanomedicine is a quickly emerging field at the interface between nanotechnology and pharmacy with even some of the COVID-19 vaccines being prime examples [1]. However, the microscopic imaging of these new technologies is lacking behind, causing a gap between practical application and theoretical understanding. In this poster, we present the results of characterizing protamine-microRNA nanoparticles (proticles) [2] using ambient Atomic Force Microscopy.

We find that deposition of the proticles via drop-casting followed by drying is possible, but highly substrate dependent. HOPG – i.e. graphite – gives the best results compared to measurements in suspension, whereas other substrates show different structures. Furthermore, nanoparticle interactions can be deduced qualitatively from the deposition patterns.

This work is funded by the Doc Academy NanoGraz of the University of Graz.



The pharmaceutical nanoparticles on graphite as imaged with AFM.



Structures found at high deposition concentration indicate unusual aggregation and diffusion behaviour.

References

1. Schoenmaker, L., Witzigmann, D., Kulkarni, J. A., Verbeke, R., Kersten, G. F. A., Jiskoot, W., & Crommelin, D. J. (2021). mRNA-lipid nanoparticle COVID-19 vaccines: structure and stability. *International Journal of Pharmaceutics*, *601*, 120586.

2. Junghans, M., Kreuter, J., & Zimmer, A. (2000). Antisense delivery using protamine–oligonucleotide particles. *Nucleic Acids Research*, *28*(10), e45-e45.