



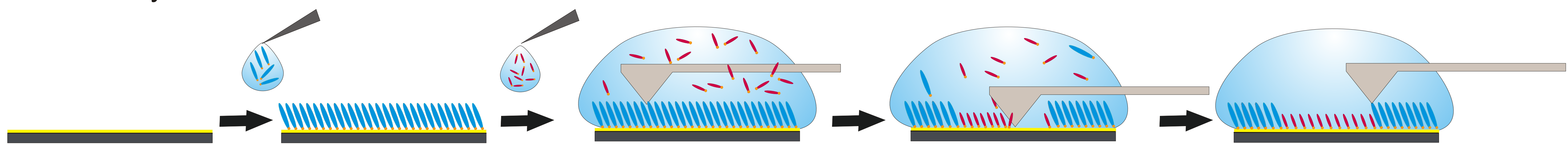
Nanostructuring of surfaces using AFM

Tatjana Ladnorg, Hasan Arslan, Stefan Heißler, Christof Wöll

Introduction

Nanostructuring of surfaces is highly desired in several disciplines and can be achieved by different methods. Especially the usage of self-assembled monolayers (SAMs¹) has been shown to be a versatile useful approach not only to tailor surface properties but also to structure surfaces using lithographic methods.

While shaving implies only removal of molecules, the grafting is performed in an organothiol solution containing liquid, enabling re-adsorption of a different SAM². Both methods allow lateral structuring with resolutions of several nanometers and, therefore, offer some potential e.g. In the field of molecular electronics, where defined small regions of only few molecules of one species are desired for conductivity measurements.

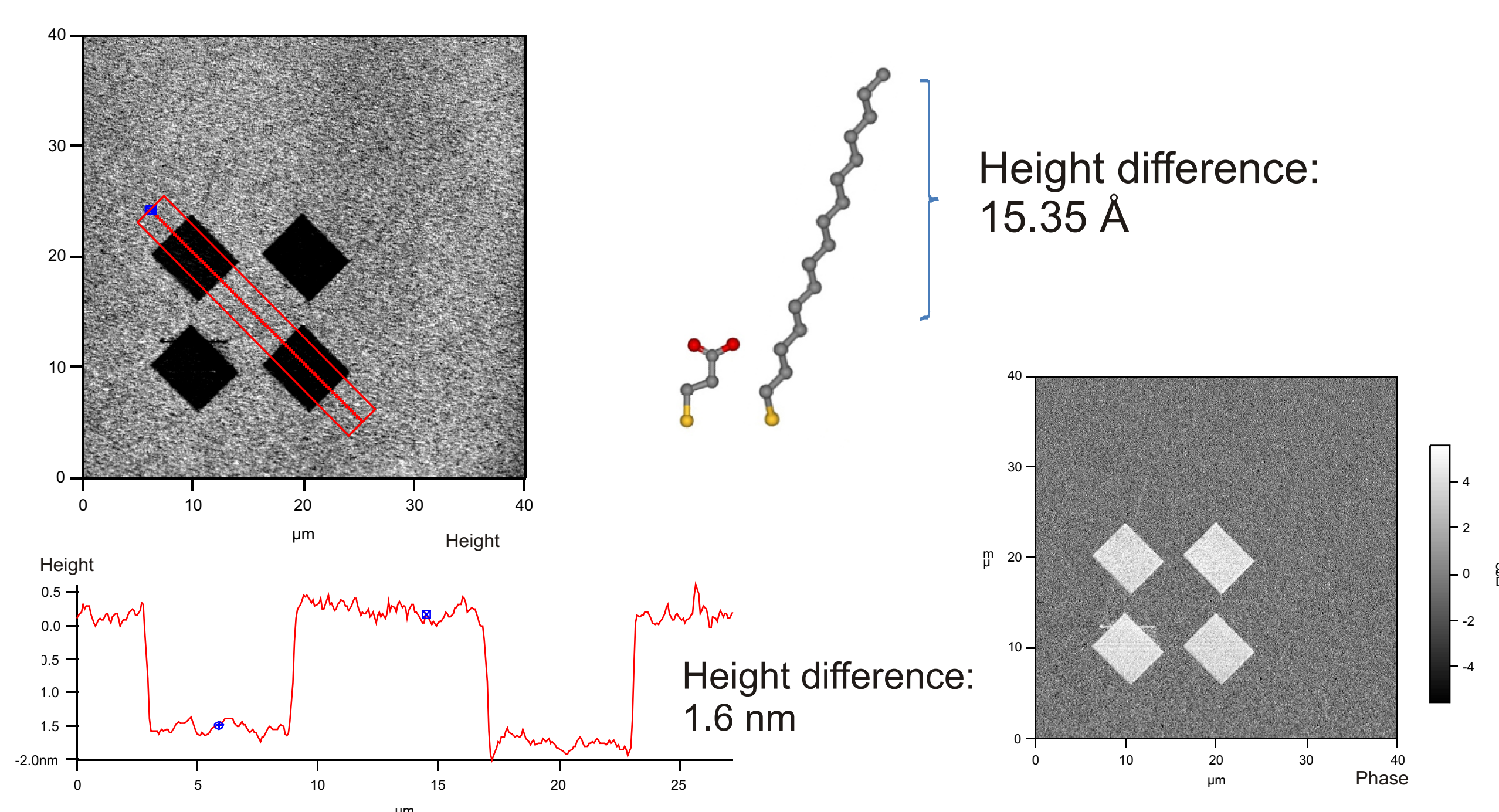


The matrix SAM is covered with an ethanolic solution of another SAM. After the removal of the matrix SAM molecules from the gold surface by the AFM tip, the vacant sites are filled up immediately with molecules out of the ethanolic solution and can be investigated by AFM with the same AFM-tip.

Functionalized SAM
Non functionalized SAM
Siliconwafer coverde with titanium and gold

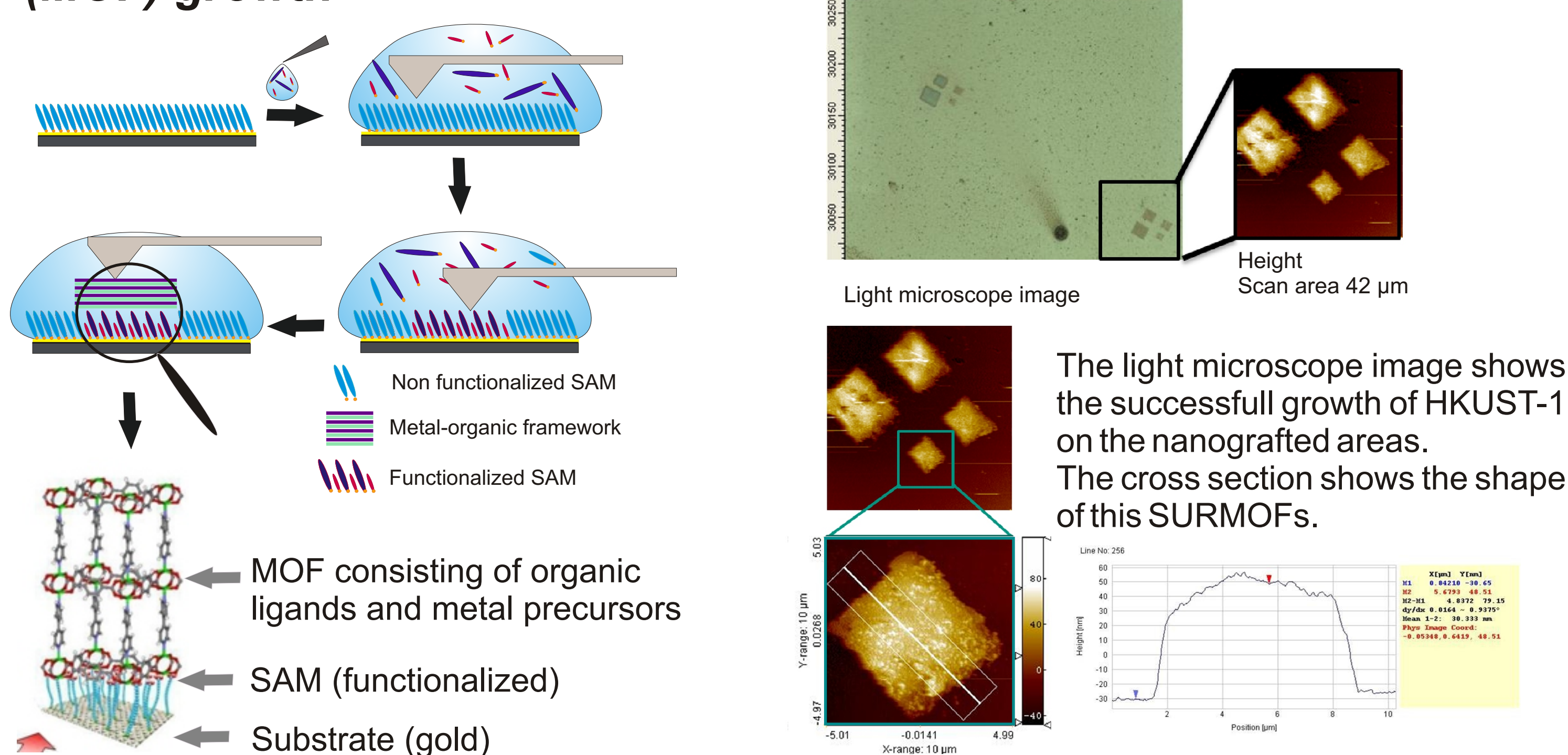
Results

Grafting of two thiols with different functional head groups

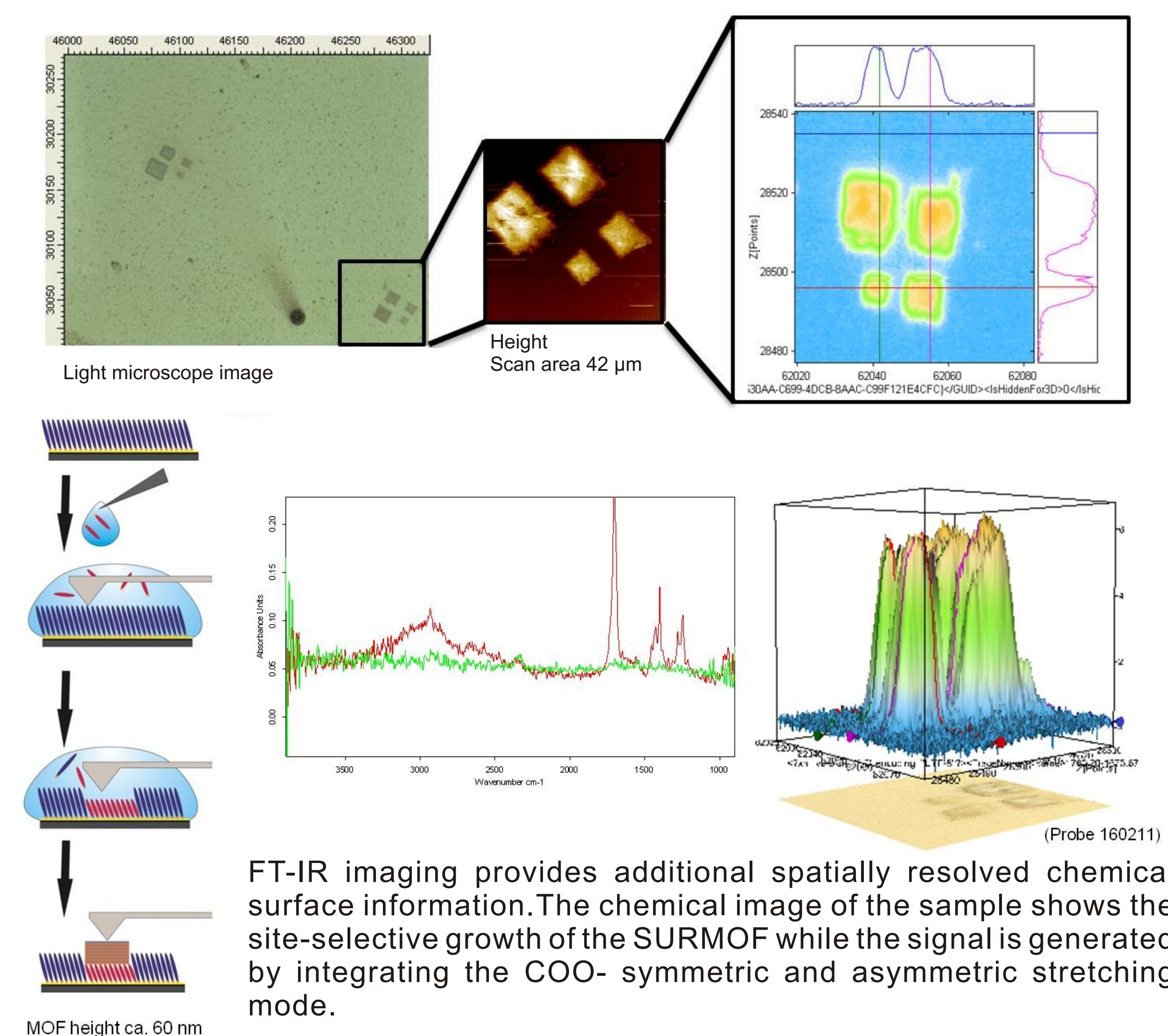


Nanografting area of mercaptopropionicacid (MPA) in decanethiol with the corresponding cross section and the phase image.

Nanografting as a base for site-selective metal-organic framework (MOF) growth



FT-IR-Analysis of the site-selective grown SURMOFs



Conclusion

Nanografting:

- small and defined structures
- in-situ characterization of the produced structures
- cleaving of individual molecular bonds
- production of multi-functional nano patterns
- applications in the field of nanotechnology

Acknowledgement

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References

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2. Liu, Amro, Liu, Ann. Rev. Phys. Chem. 59, 367 (2008).
3. Kuppler, Timmons, Fang, Li, Makal, Young, Yuan, Zhao, Zhuang, Zhou, Coordination Chem. Rev. 253, 3042 (2009).