

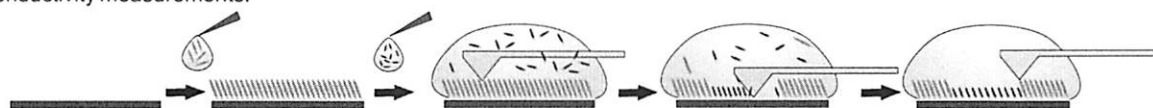
# Nanostructuring of surfaces using AFM

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## Introduction

Nanostructuring of surfaces is highly desired in several disciplines and can be achieved by different methods. Especially the usage of self-assembled monolayers (SAMs) 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 SAM<sup>2</sup>. Both methods allow lateral structuring with resolutions of several nanometers and, therefore, offer some potential in the field of molecular electronics, where defined small regions of only few molecules of one species are desired for conductivity measurements.

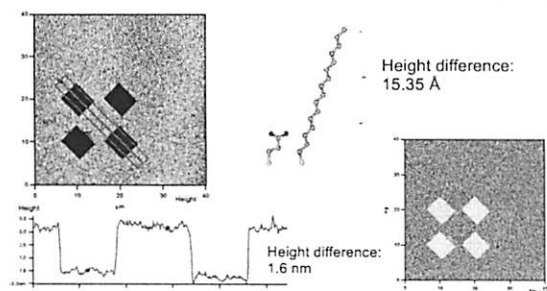


**Figure 1:** The matrix SAM is covered with an ethanolic solution of another SAM. After the removal of the matrix SAM molecules from the gold surface by the AFM tip, the vacant sites are filled up immediately with molecules out of the ethanolic solution and can be investigated by AFM with the same AFM-tip.

Functionalized SAM  
Not functionalized SAM  
Siliconwafer covered with titanium and gold

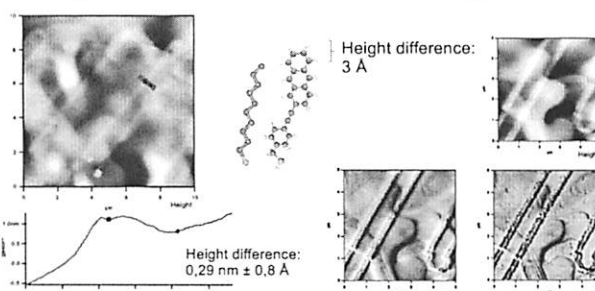
## Results

### Grafting of two thiols with different functional head groups



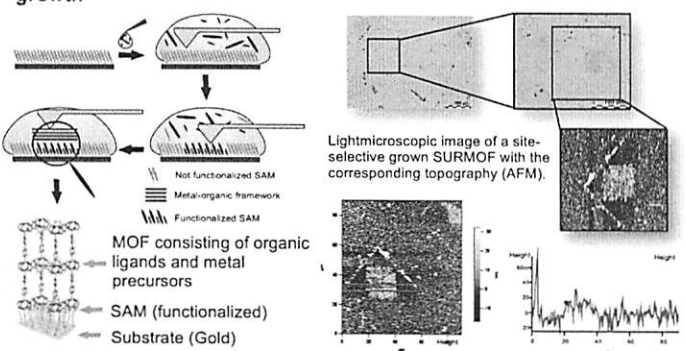
**Figure 2:** Nanografting area of mercaptopropionic acid (MPA) in decanethiol with the corresponding cross section and the phase image.

### Grafting of two thiols with different conductivity properties



**Figure 3:** Nanografting area of anthracenethiol in decanethiol with the corresponding cross section.

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



## Conclusion

### Nanografting:

- small and defined structures
- in-situ characterization of the produced structures
- sensor devices
- Applications in the field of nanotechnology

### SURMOFs:

- highly oriented porous material as model system for ...
- Active sites for sensor devices
- Selective gas adsorption
- Gas storage (Hydrogen, Methane)

## Acknowledgement

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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).