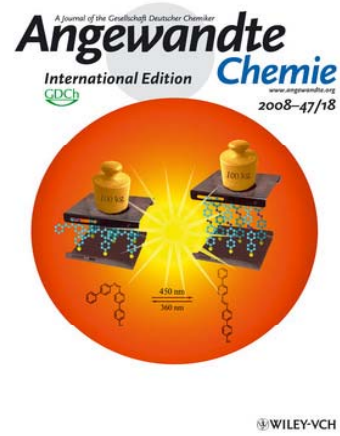
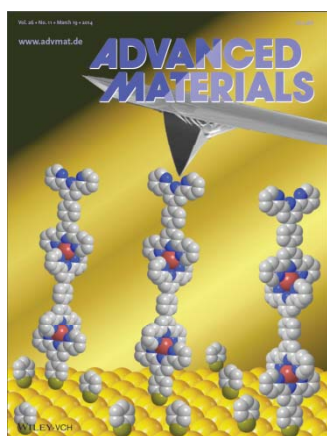


AG Zharnikov

Surface Science & Analytics

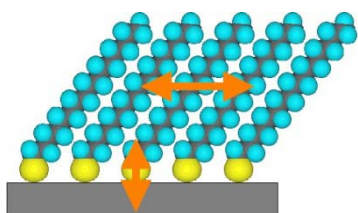
Angewandte Physikalische Chemie



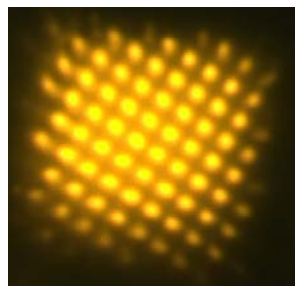
Heidelberg, 20. Nov. 2014

Research areas of the group

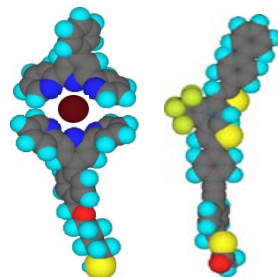
Focal objects are thin organic films, self-assembled monolayers (SAMs), nanotechnology, and bio-relevant molecular systems



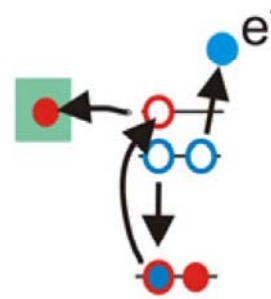
SAM design & properties



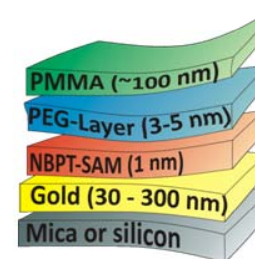
lithography & nanofabrication



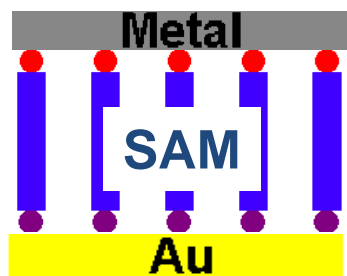
molecular electronics



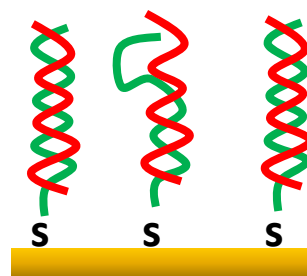
CT dynamics



ultrathin membranes



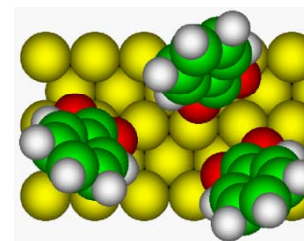
hybrid systems



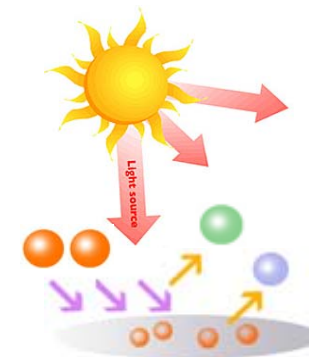
ssDNA films



biology & liquids



"standard" surface science

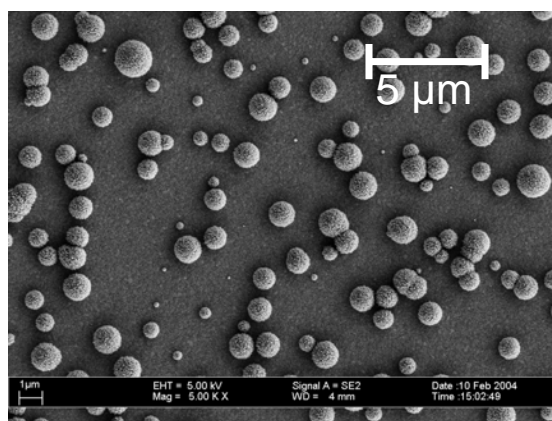
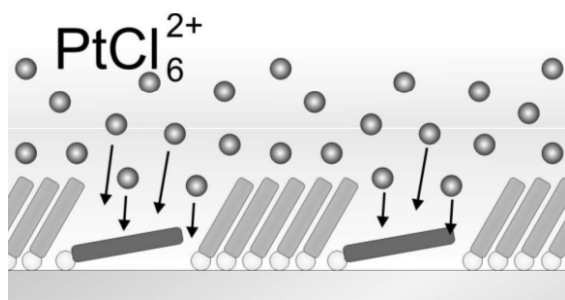


industrial projects

Synchrotron-based research (BESSY, Max-lab, ALS, etc.) and a broad, world-wide collaboration with many partner groups

Nanofabrication on the SAM basis – several examples

Electrochemical synthesis of metal nanoparticles on molecular-engineered template

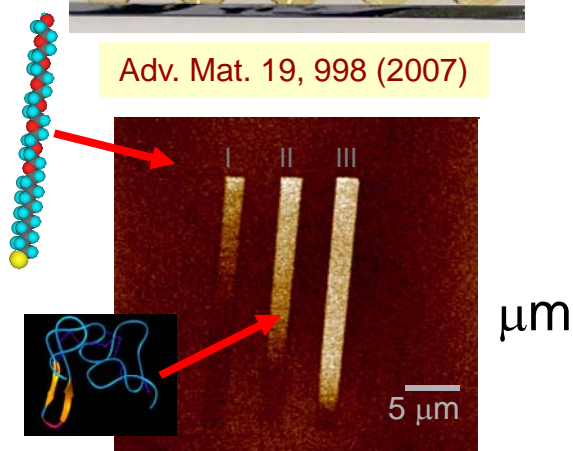


Ang. Chem. Int. Ed. 44, 2 (2005)

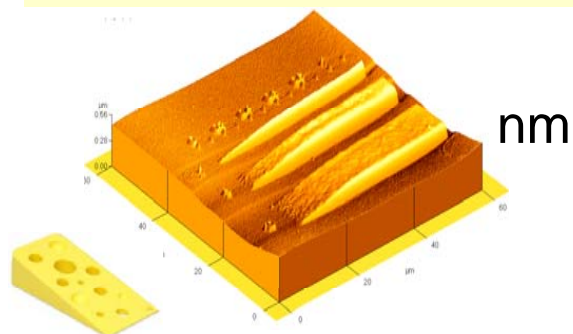
Chemical Lithography: gradient patterns



Adv. Mat. 19, 998 (2007)

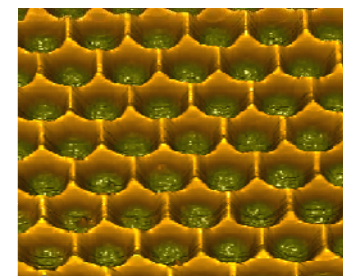


Ang. Chem. Int. Ed. 48, 5833 (2009)
Nature 460, 308 (2009) - Res. High.

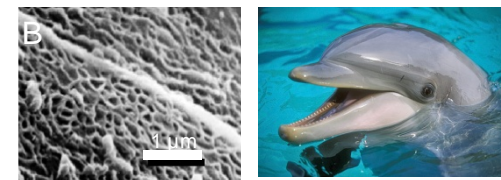


Ang. Chem. Int. Ed. 47, 1421 (2008)

Control over surface topography



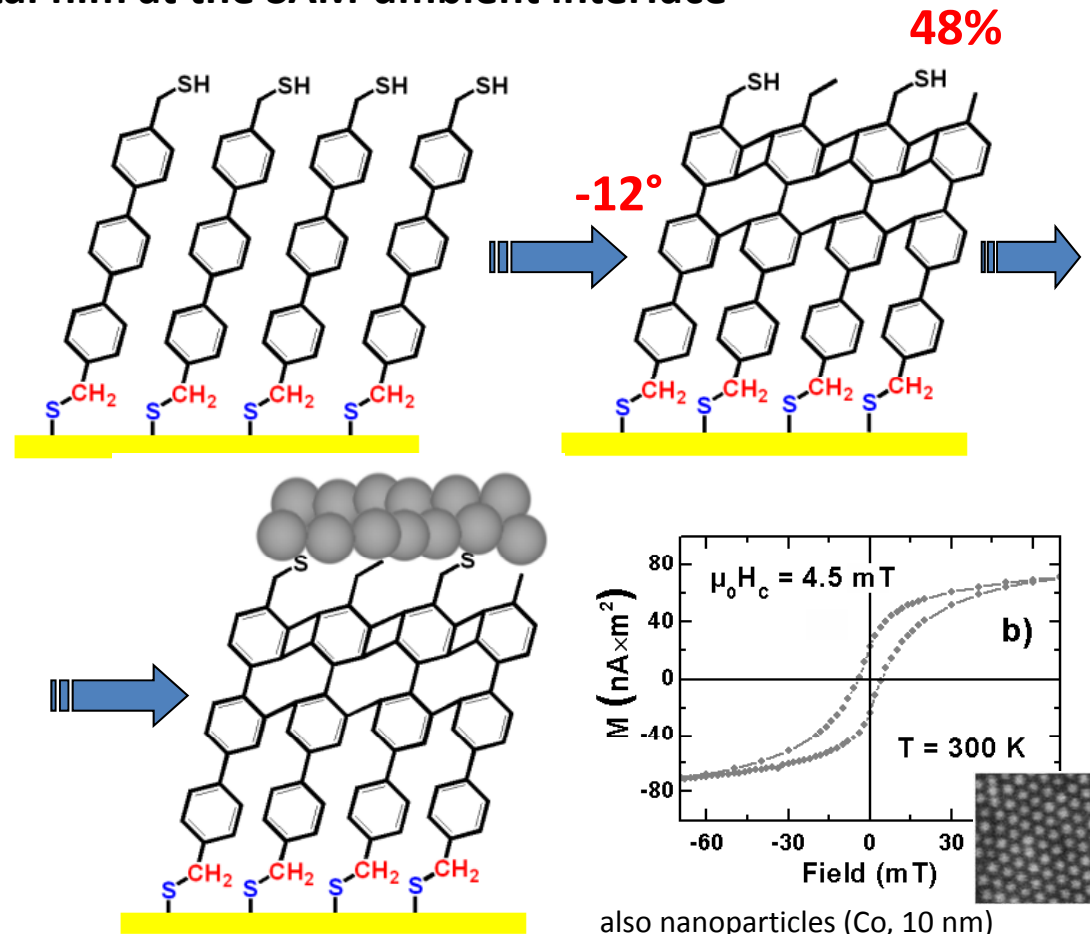
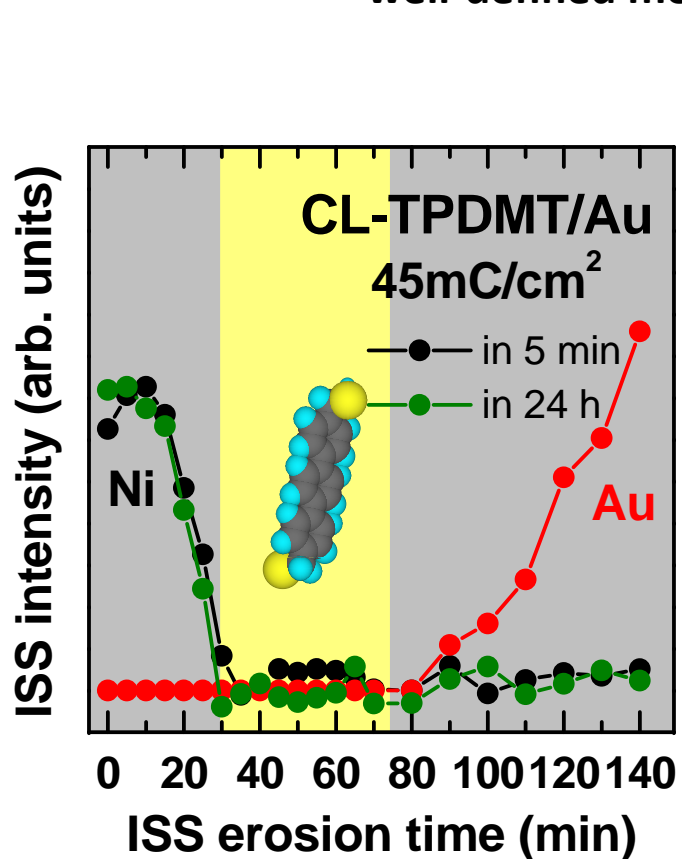
artificial dolphin skin



Ang. Chem. Int. Ed. 47, 6786 (2008)

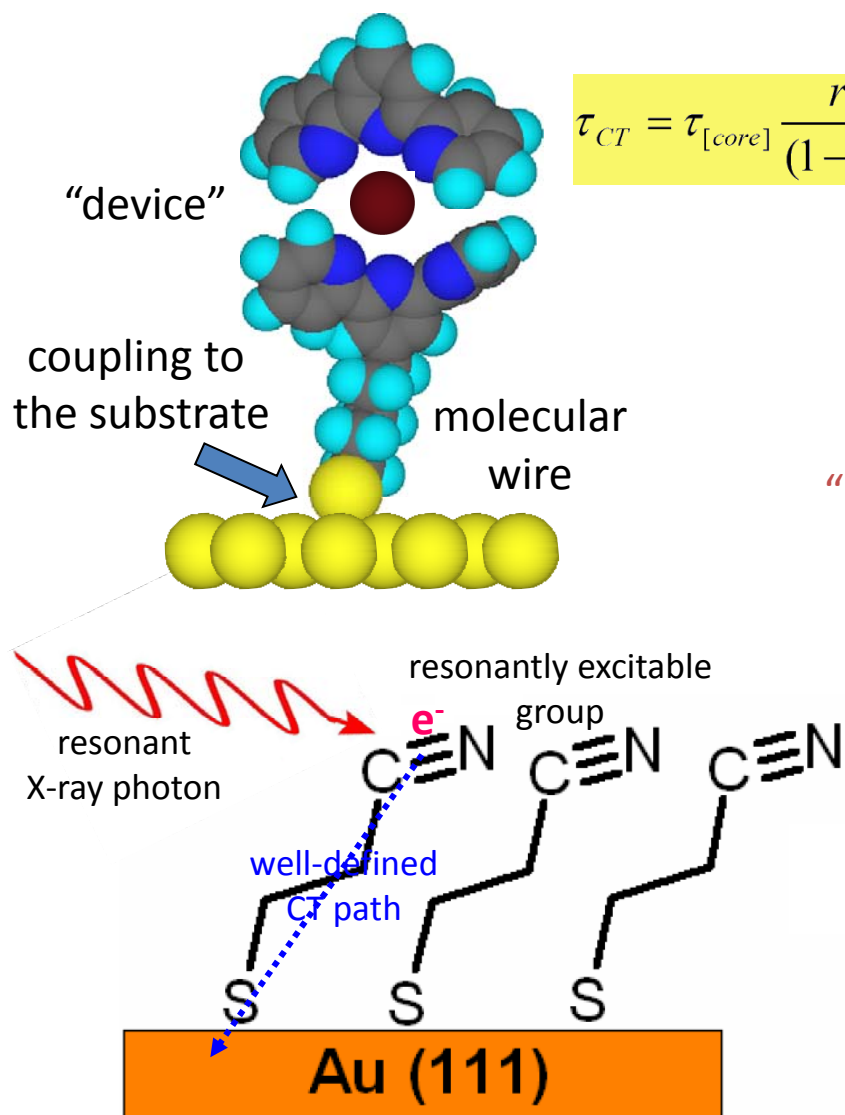
Fabrication of metal films & NP assemblies on SAM surface

Used an advanced SAM design and combining functionalization of the SAM by the thiol group with its cross-linking by e-beam, we were able to prepare well-defined metal film at the SAM-ambient interface



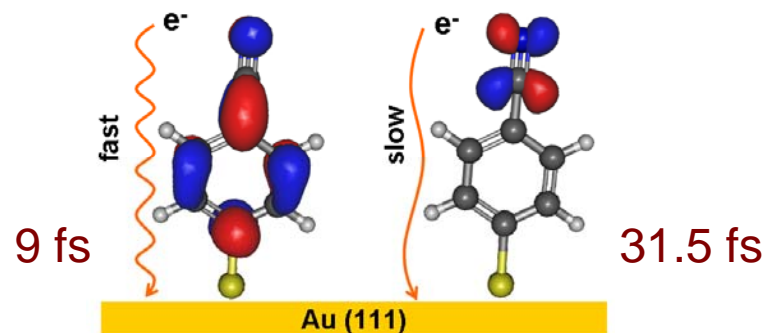
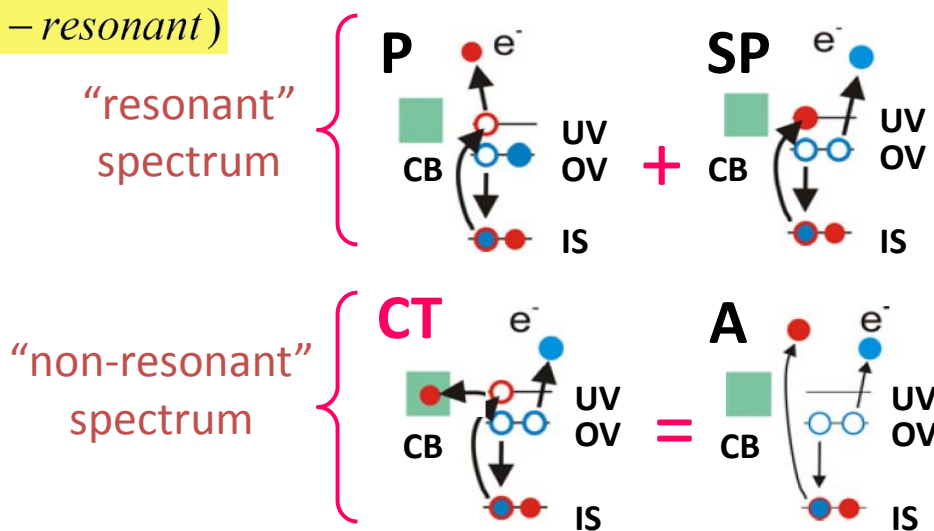
also nanoparticles (Co, 10 nm) can be assembled on SAM surface

Femtosecond charge transfer dynamics through the molecular framework – core hole clock approach



$$\tau_{CT} = \tau_{[core]} \frac{resonant}{(1 - resonant)}$$

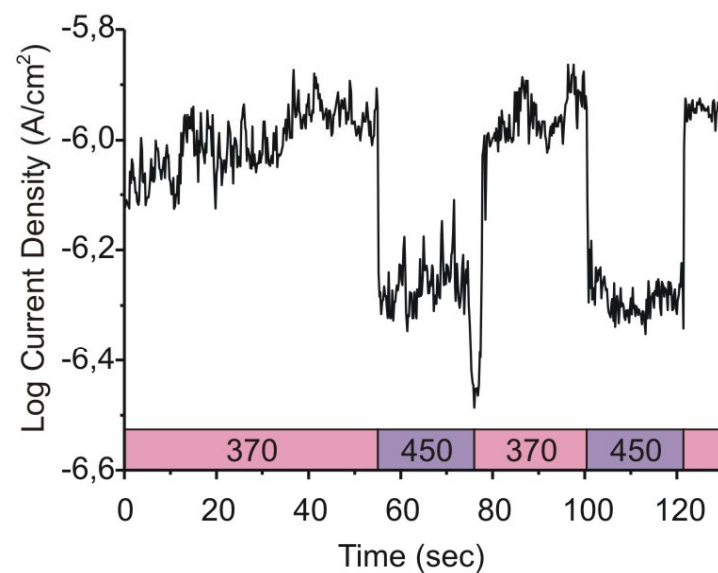
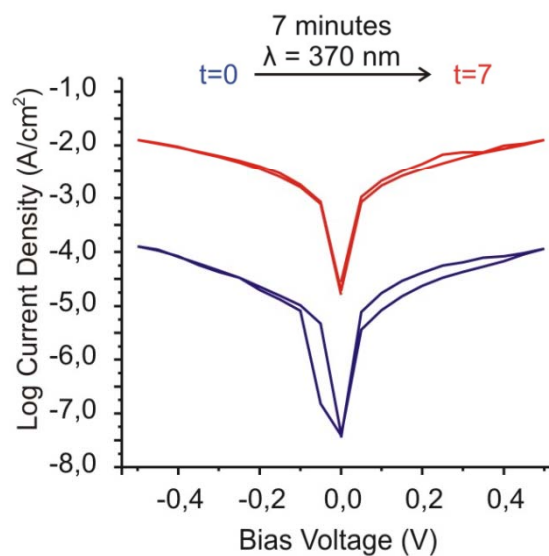
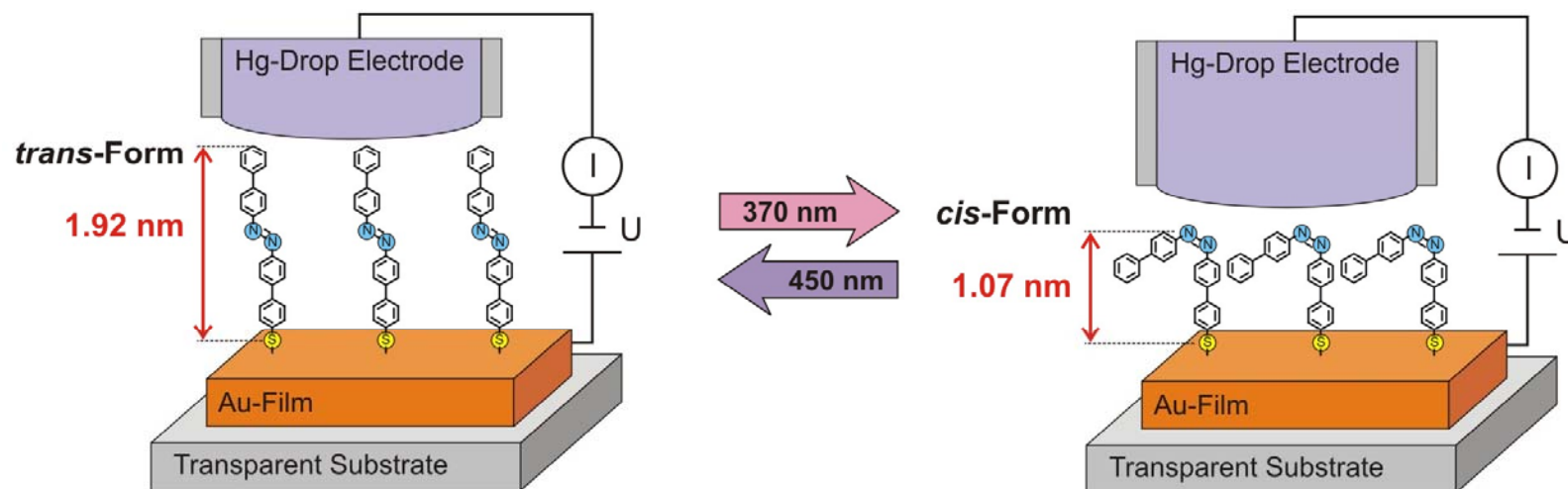
Different decay scenarios result in different decay spectra



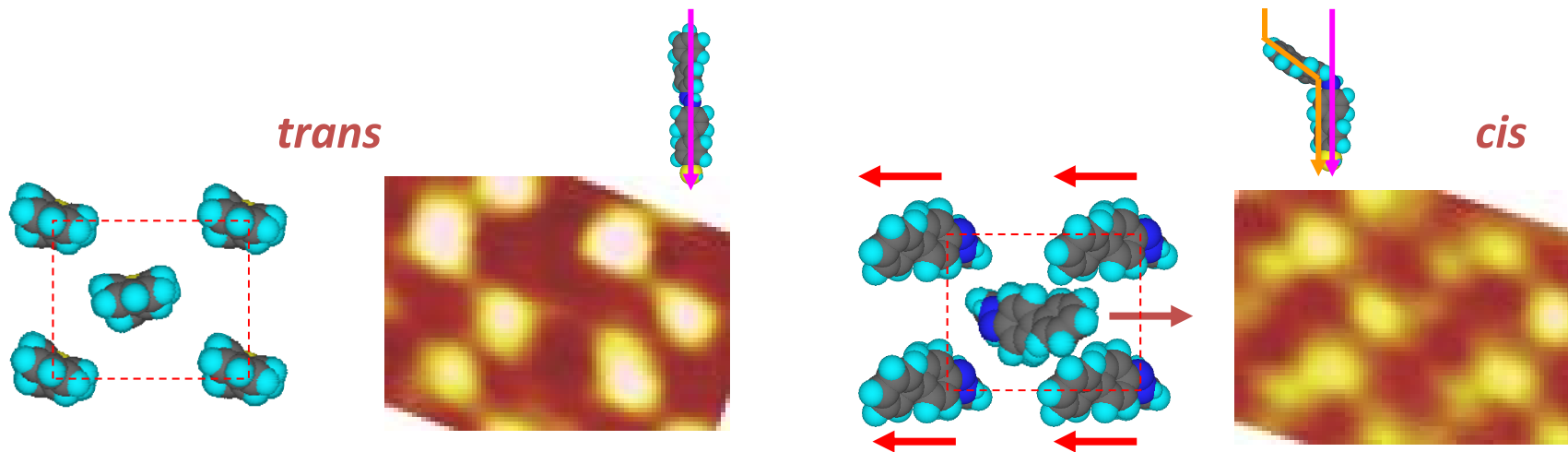
S. Neopl, MZ et al., *Chem. Phys. Lett.* 447, 227 (2007)

H. Hamoudi, MZ et al., *Phys. Rev. Lett.* 107, 027801 (2011)

Prototypes of molecular switches: light-driven *trans-cis* isomerisation in molecular junction



A schematic model of the photo-induced, cooperative isomerization: molecular domino

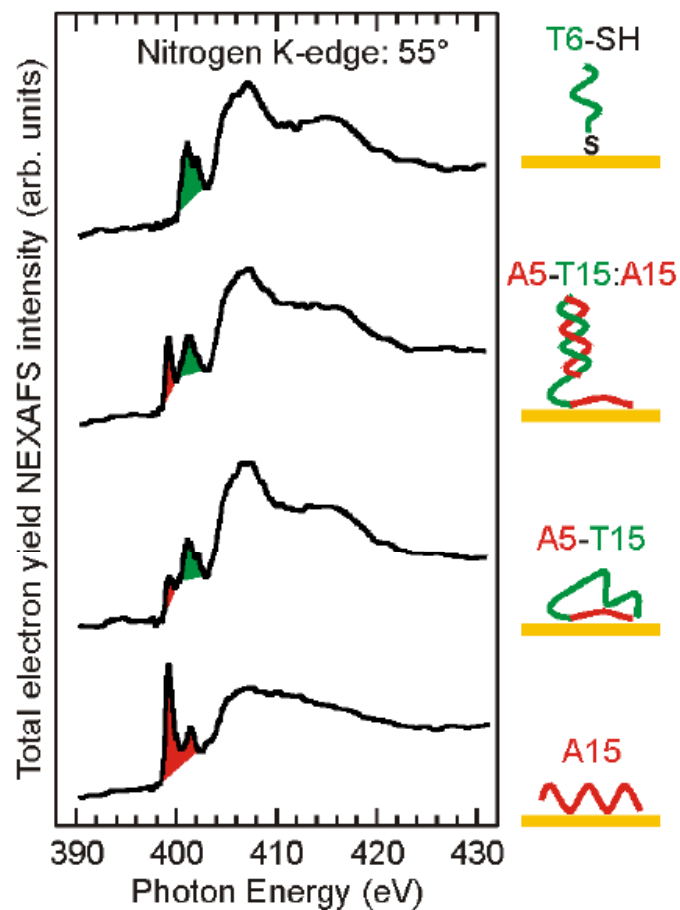


The arrows indicate the direction of the bending.



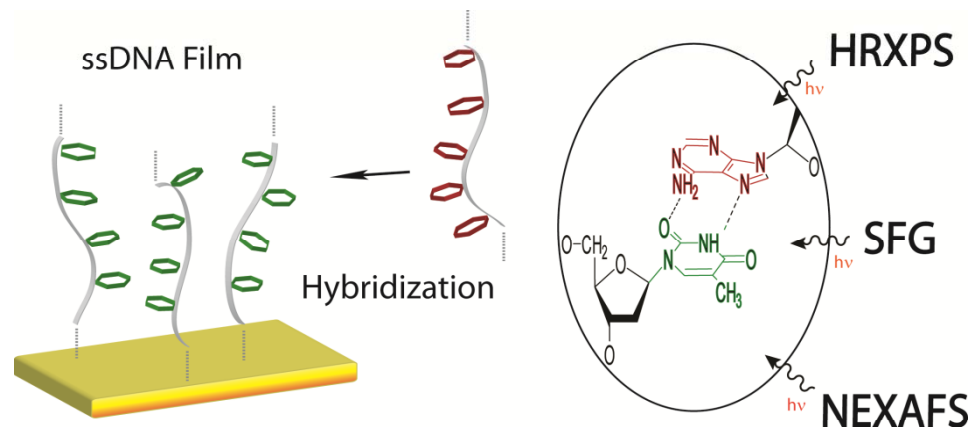
Surface-bound ssDNA: properties, hybridization ability, and patterning

orientation of the individual segments could be monitored



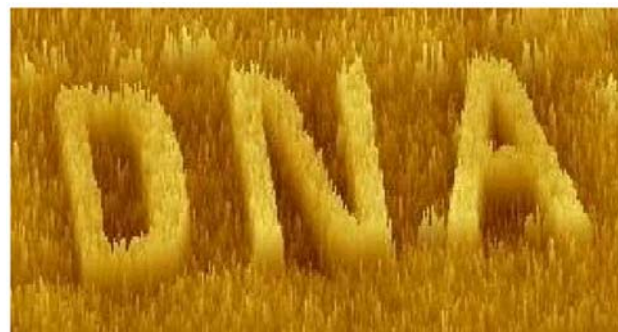
S. M. Schreiner, MZ, et al., *Anal. Chem.* **83**, 4288 (2011)

hybridization ability could be monitored



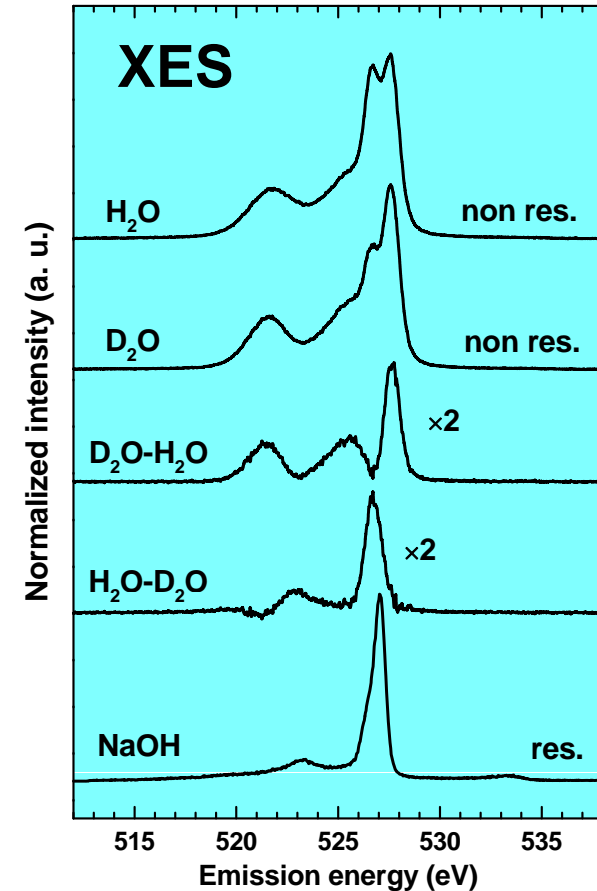
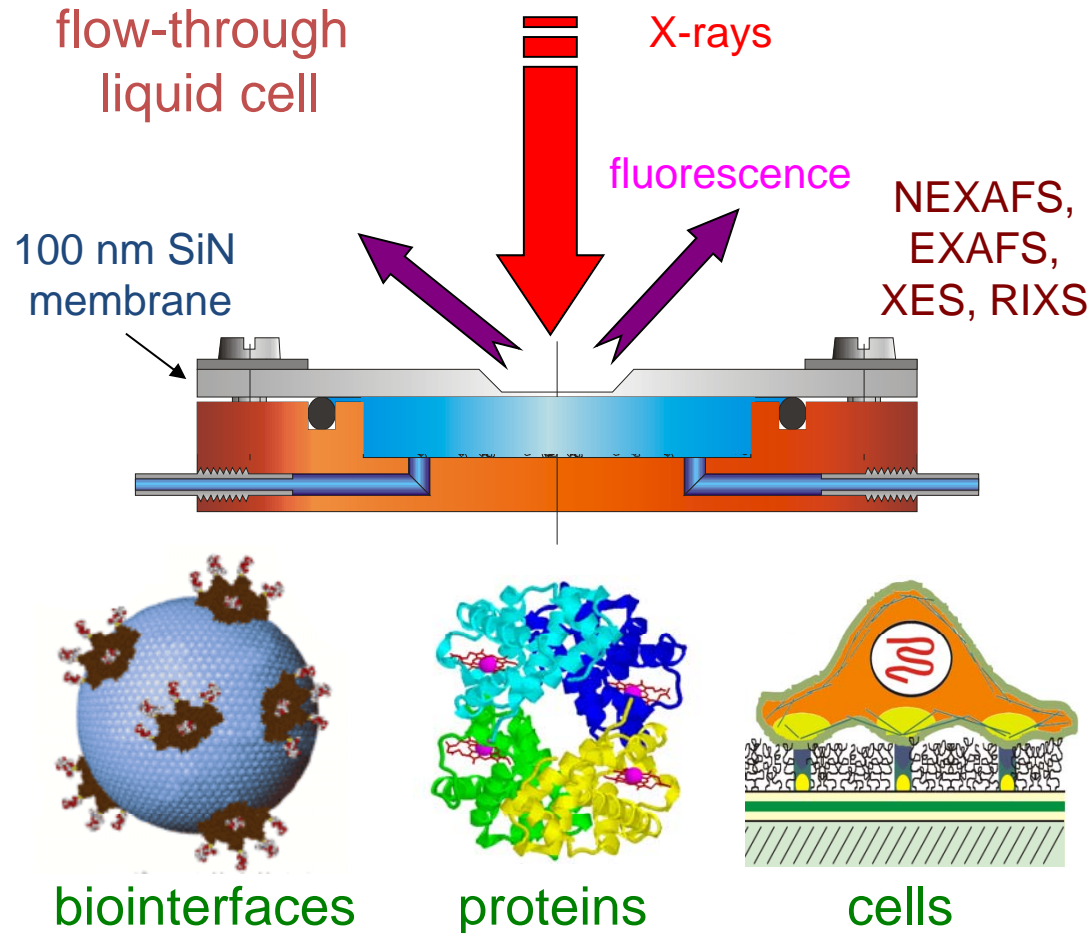
C. Howell, MZ, et al., *Chem. Phys. Lett.* **513**, 267 (2011)

A25-SH imbedded into a protein-repelling matrix by IPER-EBL



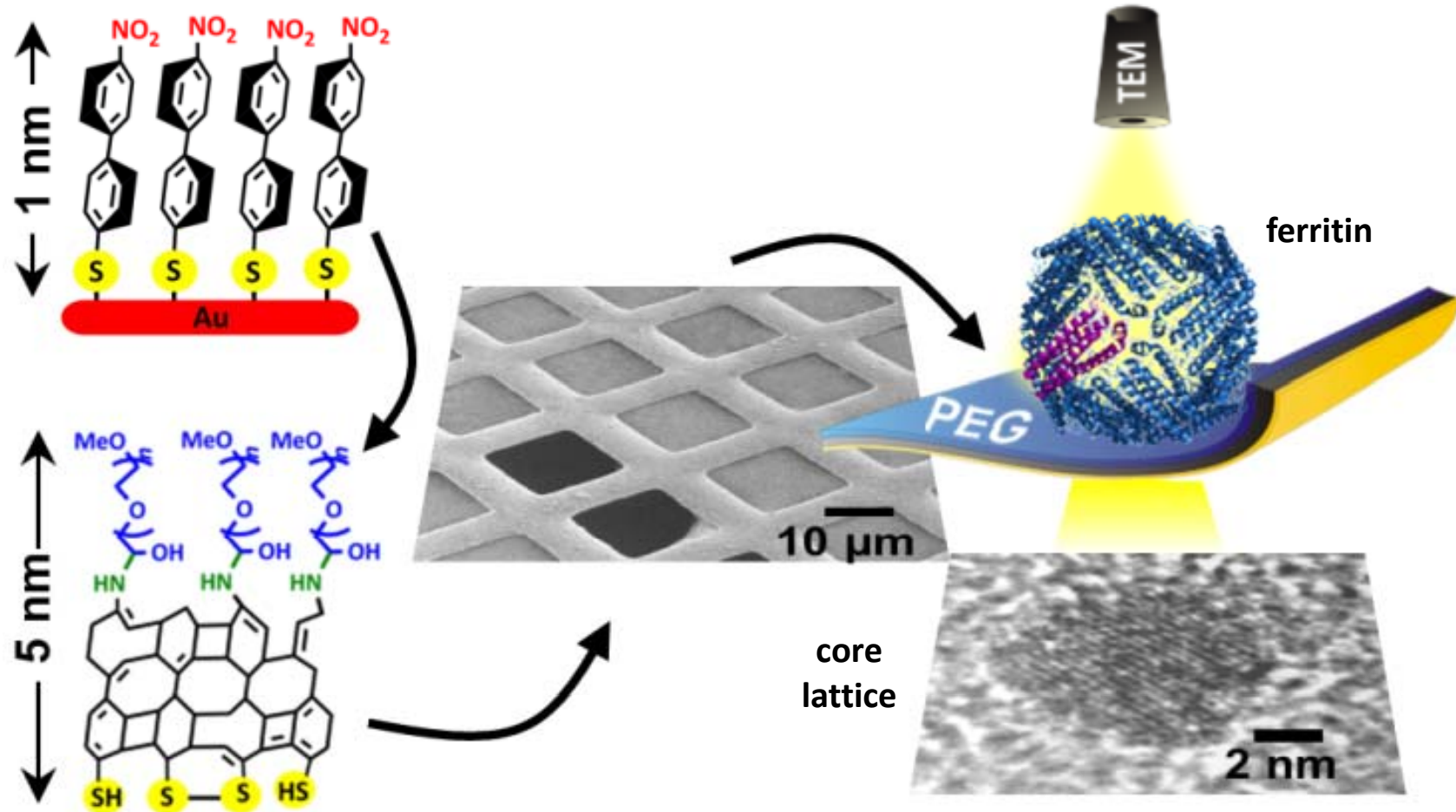
M. Khan, MZ, et al., *Ang. Chem. Int. Ed.* **51**, 10303 (2012)

Studies of liquid and biologically-relevant objects in native (aqueous) environment

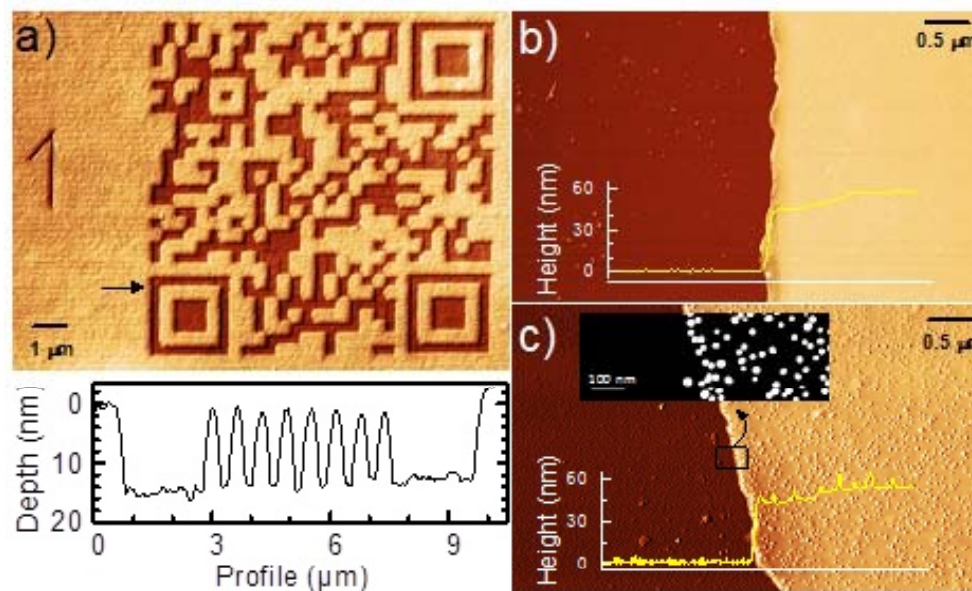
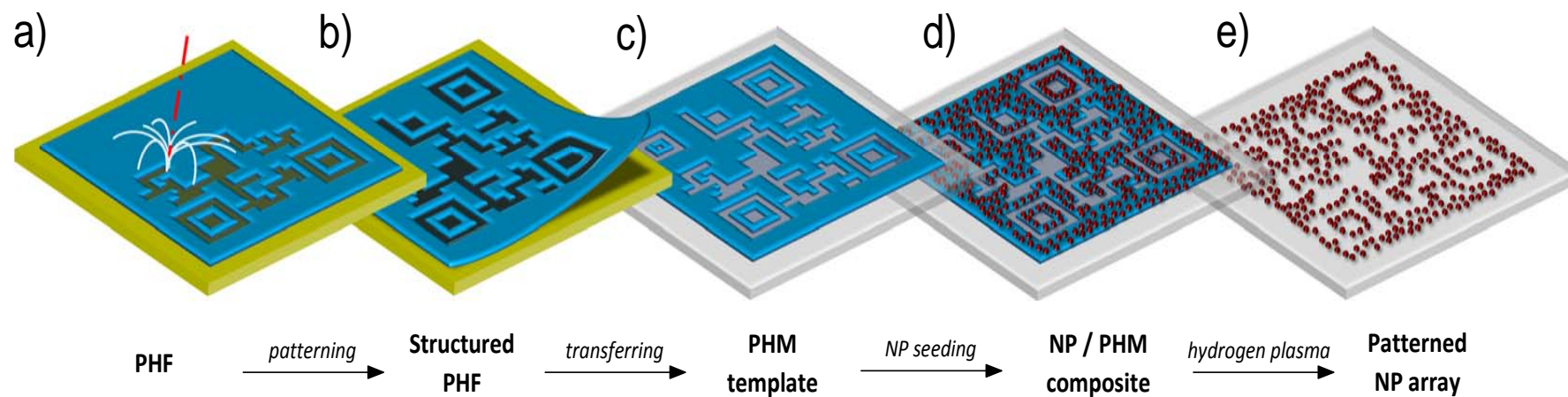


The experiments rely on precise knowledge of the XAS spectra of the basic building blocks of biological macromolecules

Design of non-disruptive, free-standing monomolecular membranes for biological applications



Hydrogel membranes as transient templates for nanopatterning



PEG-membrane on polished silicon as support



- (a) AFM image and the respective height profile above it (crossed at $x=10$ nm).
- (b) AFM image of the membrane's edge (measured at $x=10$ nm).
- (c) AFM image after immersion of (a) into an aqueous solution.
- (d) AFM image after immersion of (a) into fluorescence solution.



Gruppezusammensetzung und Leistung

Momentan: 4 Doktoranden und 2 Postdocs

Jeder Doktorand/Postdoc hat sein eigenes Projekt bzw. Projekte und mitarbeitet, unter Umständen, auch an anderen Projekten.

nur Drittmittel-Finanzierung

2010-2014:

72 Publikationen in referierten Zeitschriften

87 Tagungsbeiträge, davon 24 eingeladen