The SNI supports PSI titular professors
Thomas Jung studies nanonetworks

Professor Thomas Jung leads a research group at the Paul Scherrer Institute (PSI) as well as a team at the University of Basel's Department of Physics. His groups study molecules and nanostructures on surfaces with a view to potential applications in a wide range of areas. Jung is interested in the mechanical, magnetic and electronic properties of the molecular surface structures, which self-assemble in suitable conditions but can also be formed by specific on-surface chemical reactions or by the precise placement of individual atoms or molecules.

Physics and chemistry of pores
His investigations focus on two-dimensional networks of identical building blocks, as well as metal-organic frameworks (MOFs). These compounds made up of metals and organic building blocks form a regular arrangement of pores, which are studied in relation to molecular data storage devices, for example, as well as in catalysis and electrochemistry.

Until 2018, Thomas Jung was the supervisor of a doctoral dissertation at the SNI PhD School, working closely alongside Professors Catherine Housecroft and Edwin Constable from the Department of Chemistry. In the dissertation, Dr. Thomas Nijs demonstrated how much the architecture of MOFs can vary in response to changes in the initial building blocks and in the conditions for self-organization. For example, the scientists used detailed images obtained using a

Aisha Ahsan and Thomas Jung are able to control single gas atoms in metal-organic frameworks.

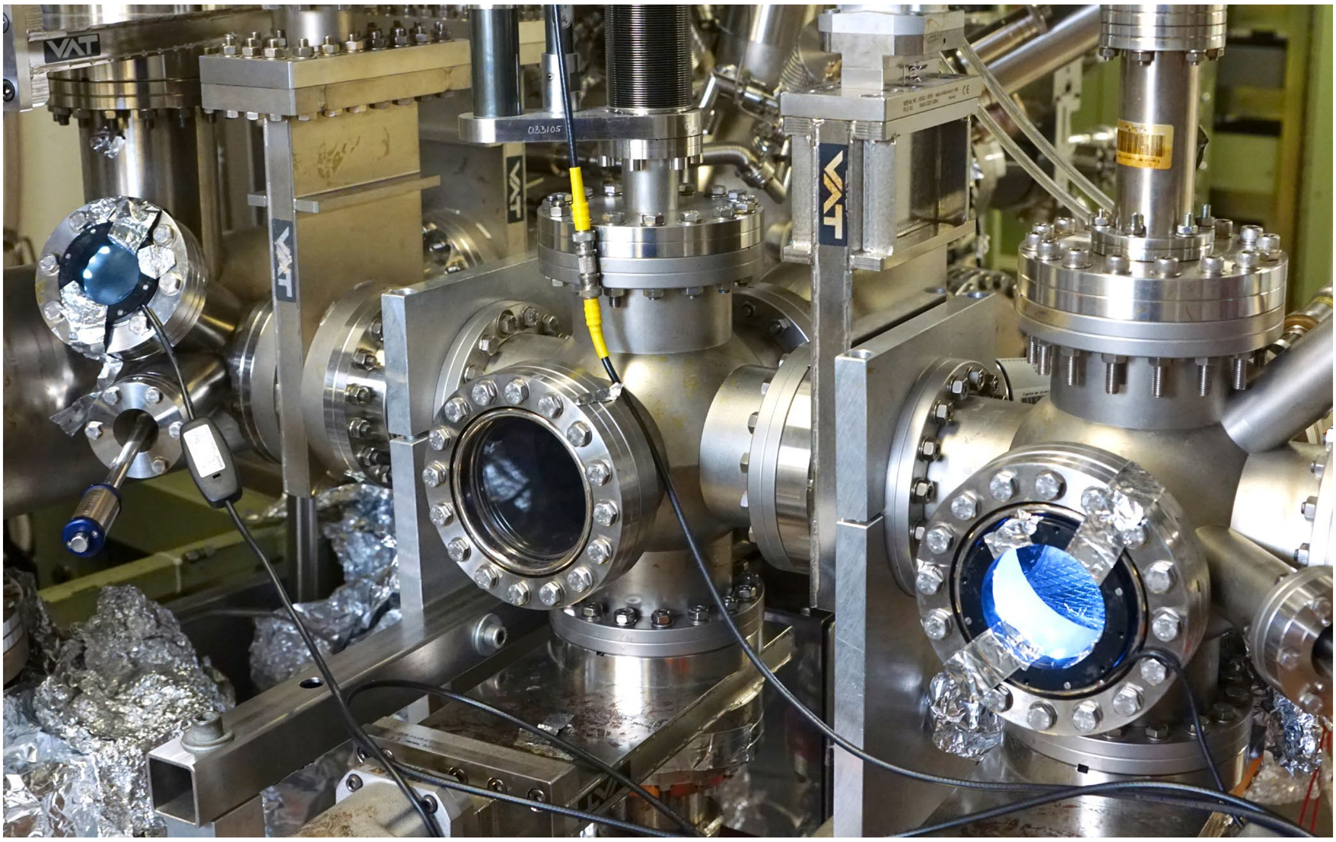
scanning tunneling microscope to show that, in certain conditions, ladder-like structures can be converted into rhombuses simply by increasing the temperature.

Basis for data storage units

Metal-organic frameworks of this kind could also form the basis for tiny storage units made up of just a few atoms, as demonstrated in another doctoral dissertation supervised by Thomas Jung. In her dissertation, Dr. Aisha Ahsan began by producing a self-organized organometallic network that resembled a sieve with precisely defined pores. She then introduced xenon gas atoms into the pores, which were just over a nanometer in width. Using temperature changes and by applying localized electrical pulses, Aisha Ahsan was able to switch the state of the xenon atoms back and forth between solid and liquid. In principle, a phase change of this kind at the level of individual atoms could be used to store data, opening up entirely new possibilities for the development of tiny data storage devices, as Jung's team described in a 2018 publication in the journal "small".

"The work of my groups at the University of Basel and the PSI excellently complement each other. We can use the infra-structure at both sites and benefit from the scientific exchange with our colleagues."

Prof. Thomas Jung, Department of Physics, University of Basel and Paul Scherrer Institute



Single molecules can be placed on surfaces in an ultra-high vacuum system.