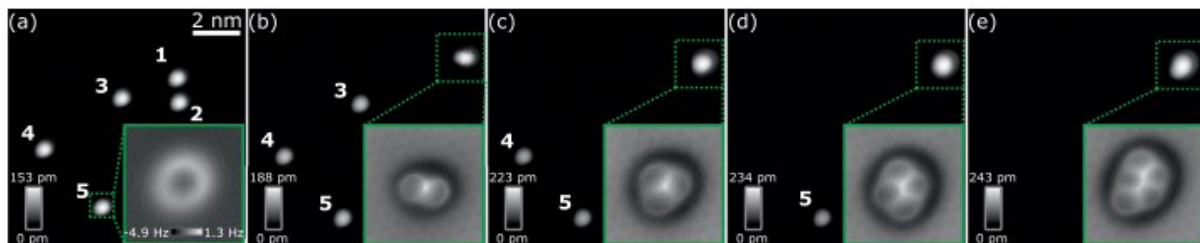


# Ph.D. Position in Experimental Physics

University of Regensburg

We offer a PhD position in low temperature solid state physics. The candidate will work on a custom built, combined scanning tunneling and atomic force microscope (STM/AFM) which is operating at liquid helium temperatures in ultra high vacuum conditions. The combination of STM with AFM permits us to study physical phenomena on the atomic scale on a broad basis. With the STM we can selectively tunnel in particular states of the density of states while at the same time atomic forces can be probed in the pico-newton regime with the AFM.



Our home built machine is currently optimized for investigating individual atoms and small clusters which are placed and altered on a Cu(111) surface (above figure shows the atom by atom assembly of a cluster consisting of five iron atoms; the insets are acquired in the AFM channel, while the overview images were recorded in STM mode) [2,3]. We employ CO terminated tips, which allow us to artificially create small clusters atom by atom and image the created structures with atomic resolution [3].

A possible project for the candidate is to decouple the atoms and clusters electronically from the surface by putting them on an electrically insulating buffer layer, as e.g. well-studied Cu<sub>2</sub>N islands on Cu(111) [4]. The first step of this project is to study the physical properties of electrically decoupled iron atoms and clusters with CO terminated tips. Additionally, the proposed sample system allows us to investigate whether atomically precise engineering of magnetic tips is possible, since the iron atoms are more weakly bound to the Cu<sub>2</sub>N islands [5] and hence could be controllably picked up by the tip. This would open the possibility to probe magnetic properties of single iron atoms and small iron clusters without applying an external magnetic field.

Ideally, the candidate already worked in the field of surface science, has experience with UHV and low temperature systems, and optionally possesses knowledge about STM or/and AFM.

Applications should be sent along with a CV, a brief cover letter including why this position would appeal to you, and a transcript of recent grades per email to:

Prof. Dr. Franz J. Giessibl

[franz.giessibl@ur.de](mailto:franz.giessibl@ur.de)

Related articles:

- [1] D. M. Eigler *et al.*, Nature **344**, 524 (1990)
- [2] M. Emmrich *et al.*, Science **348**, 308 (2015)
- [3] J. Berwanger *et al.*, Phys. Rev. B **98**, 195409 (2018)
- [4] M. Schneiderbauer *et al.*, Phys. Rev. Lett. **112**, 166102 (2014)
- [5] S. Loth *et al.*, Science **335**, 196 (2012)
- [6] A. Khajetoorians *et al.*, Science **339**, 55 (2013)
- [7] F. Pielmeier *et al.*, New J. Phys. **17**, 023067 (2015)