

O 22: Overview Talk: Peter Liljeroth

Time: Tuesday 9:30–10:15

Location: H15

Invited Talk

O 22.1 Tue 9:30 H15

Engineered electronic states in atomic and molecular lattices

— ●PETER LILJEROTH — Department of Applied Physics, Aalto University School of Science, PO Box 15100, 00076 Aalto, Finland

Constructing designer materials where the atomic geometry and interactions can be precisely controlled is becoming reality. In this tutorial talk, I will discuss the general progress towards this aim using examples based on atomic manipulation by the tip of a scanning tunneling microscope (STM) and molecular self-assembly to reach the desired structures.

Using atomic manipulation, it is possible to construct lattices where every atom is in a well-defined, predetermined position. This opens possibilities for creating artificial materials and I will illustrate this

concept by showing how chlorine vacancies on Cu(100) [1] can be used to implement various one- and two-dimensional artificial lattices [2].

Similar concepts can be realized using metal-organic frameworks (MOFs) as a tuneable platform for achieving materials with engineered electronic structures. The synthesis of 2D-MOFs is usually carried out on metal surfaces (e.g. Au, Ag, Cu), where it is difficult to access their intrinsic electronic properties. I will discuss possibilities of synthesizing 2D-MOFs on weakly interacting substrates and assessing their structure and electronic properties through atomic force microscopy (AFM), STM and scanning tunneling spectroscopy (STS) [3].

[1] F.E. Kalff et al. *Nat. Nanotech.* 11, 926 (2016). [2] R. Drost et al. *Nat. Phys.* 13, 668 (2017). [3] A. Kumar et al. *Nano Lett.* 18, 5596 (2018).