Unraveling Surface Enabled and Site-specific Phenomena in Low Dimensional Supramolecular Architectures

Abstract

Future quantum technologies, for example, rely on the detailed understanding of the interaction between different well-defined electronic states. Surface supported atomic and molecular systems provide a base for such investigations with the particular advantage of addressability. In our work we establish on-surface architectures which exhibit extraordinary local e.g. electronic, magnetic and quantum properties originating from the reduced dimensionality of the self-assembled and atomically precise architectures. Quantum well arrays, for example, can be produced by the interaction of porous on-surface networks with 2D Shockley-type surface states. Interestingly the periodicity of these (lossy) confinements causes band formation by the coupling between the individual quantum well [1]. In our more recent work the quantum wells have been modified by the adsorption / condensation of Xe atoms [2,3]. Localized and delocalized electronic states can be identified across the 2D array as they lead to new, site-specific physical and chemical behavior.

Sublattices in 2D 'checkerboard' architectures of magnetic molecules on magnetic substrates can be selectively switched by chemical ligation [4]. Also we have observed the first example of 2D ferrimagnetic long-range order and remanence for such a 2D architecture on non-magnetic Au(110) [5]. Uniquely, self-assembled 2D architectures contribute to our understanding of fundamental interactions involved in host-guest systems and allow for the specific operation of quantum states with a partial delocalization delocalized by the supramolecular on-surface architecture.

Bio

Thomas Jung is a Staff Scientist at Paul Scherrer Institute, working in the field of nanometer-scale science and technology, in particular in molecular self-assembly, molecular switching and exploratory single molecular devices. In his Ph.D. he developed dedicated Atomic Force Microscopy experiments for nanomechanics, magnetic imaging and for single flux line investigations above superconductors. He implemented AFM at PSI's Zürich Research Laboratory before joining IBM's T. J. Watson Research Laboratory in Yorktown Heights NY (US) as a Post Doctoral Fellow in 1992. Here he worked on the electronic states of metallic wires and islands. Between 1994 and 1997 he experimented with individual molecules, their self-assembly, positioning and their conformation at IBM's Zürich Research Laboratory in Rüschlikon, Switzerland.

Thomas Jung is a member of the American Physical Society, the American Association for the Advancement of Science and the Swiss Physical Society. From 1999 to 2002 he served his community as the President of the Swiss Physical Society. He has organized and co-organized several international and scientific conferences and workshops to promote scientific issues as well as the public understanding of science and technology.

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