Molecular orbital imaging and spectroscopy on hydrogen passivated semiconductors

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In order to facilitate molecular orbital imaging and spectroscopy based on the state-of-the-art use of modern nanotechnology tools, such as STM and NC-AFM, electronic decoupling of the molecule in question from the underlying substrate is required. It is expected that proper isolation of such molecular entities could be achieved by application of passivated semiconductor surfaces, e.g., Si(001):H and Ge(001):H.

Following the first experiments with pentacene molecules on the Si(001):H surface we performed measurements of trinaphthylene molecules (Y molecules) on the hydrogenated Ge(001):H substrate with the application of tuning fork based sensors. They facilitate simultaneous STM and NC-AFM measurements and thus molecular orbitals could be probed by both tunneling current and atomic forces concurrently. In the presentation we will discuss also the role of surface dangling bonds (DBs) on the adsorption, immobilization and imaging of the molecules.