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Ultrafast terahertz scanning tunneling microscopy with atomic resolution (I)

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The ability to directly probe ultrafast phenomena on the nanoscale is essential to our understanding of excitation dynamics on surfaces and in nanomaterials. Recently, a new ultrafast scanning tunneling microscope (STM) technique that couples terahertz (THz) pulses to the scanning probe tip of an STM was demonstrated (THz-STM), showing photoexcitation dynamics of a single InAs nanodot with simultaneous 0.5 ps time resolution and 2 nm spatial resolution under ambient conditions. Operation of THz-STM in ultrahigh vacuum now makes it possible to spatially-resolve subpicosecond dynamics of single molecules and silicon surfaces with atomic precision. This talk will discuss how THz-STM works and how it can provide new insight into ultrafast dynamics on the atomic scale, which is essential for the development of novel silicon nanoelectronics and molecular-scale devices operating at terahertz frequencies.

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