Atomically-Flat Nanosurfaces: Flat Gold Nanoparticles as a Novel Substrate for Scanning Tunneling Microscopy

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Flat gold nanoparticles (FGNPs) can be used as atomically-flat gold substrates for STM studies. When supported on indium tin oxide (ITO) coated glass, the FGNPs ar also photonically active substrates. Transmission electron microscopy (TEM) shows that FGNPs can be prepared 100–500 nm across with shapes that range from triangular to hexagonal with thicknesses of 15-25 nm. Scanning tunneling microscopy (STM) reveals atomically flat terraces on the large {111} FGNP facets, which are flat to a few atomic layers over entire surface. No stepping (rounding) of the facet is observed even near the edges. STM images demonstrate that well-ordered alkanethiol self-assembled monolayers (SAMs) form on the FGNP/ITO substrates, thus they are excellent substrates for molecularly resolved STM imaging.