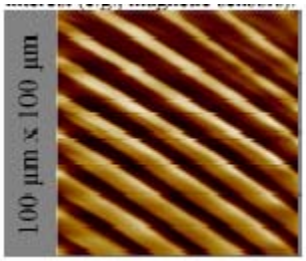
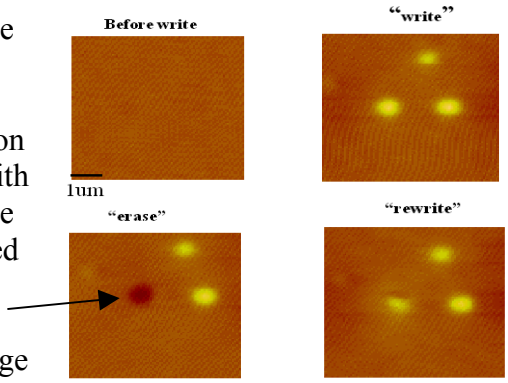
IRG 2 - Dendrimer-Based Hybrid Nanocomposite Films

Dendrimer Assisted Nanotransfer Printing (nTP) We have recently shown that a monolayer of a dendrimer on a silicon substrate allows direct transfer of ultrathin metal films from a patterned stamp onto the substrate. In this method, a dendrimer monolayer is self-assembled onto the substrate from solution. A metal layer, or layers, is deposited in vacuum onto a patterned polymer stamp, itself formed over a hard master using photolithography or other technique. When the stamp is brought into contact with the dendrimer modified substrate, the metal is transferred to the substrate. The image below shows 20 nm high Co "wires" patterned in this way. It is possible to transfer metal multilayers using this technique, allowing direct patterned transfer of, for instance, a magnetic metal layer sandwiched between two nonmagnetic layers, a structure which would have technological interest (e.g., magnetic sensors).

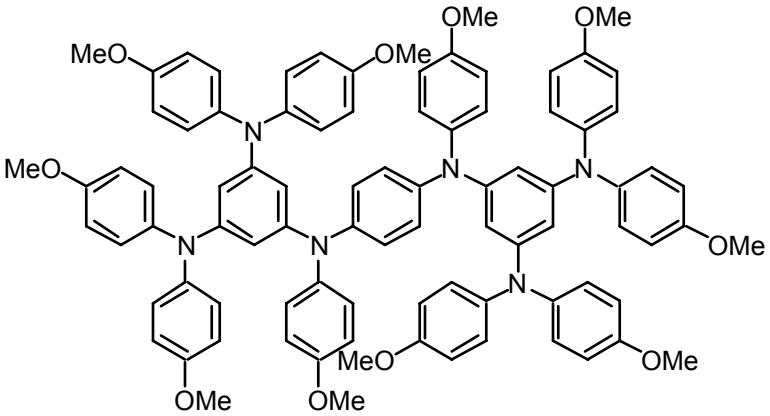


Molecular Storage by Charge Trapping



Silas Blackstock, Greg Szulczewski, and Jia Sun at the University of Alabama MRSEC demonstrated charge trapping in 2 nm thick film of a designed charge-storage arylamine dendrimer vapor deposited on silicon substrates. The Kelvin probe images are recording with a conducting AFM and show charge localization in the thin films. The upper left panel shows the as deposited film. The upper right panel shows the surface potential contrast after contacting the film in 3 regions for 1 second with the probe tip, injecting charge into individual dendrimers. These regions remain charged for about 1 hour. The stored charge can be neutralized by reversing the tip polarity and again touching the surface, as shown in the lower left panel. In the final panel, this region is recharged, showing that this is a reversible process.

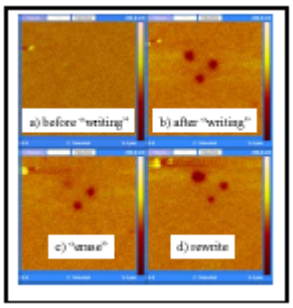
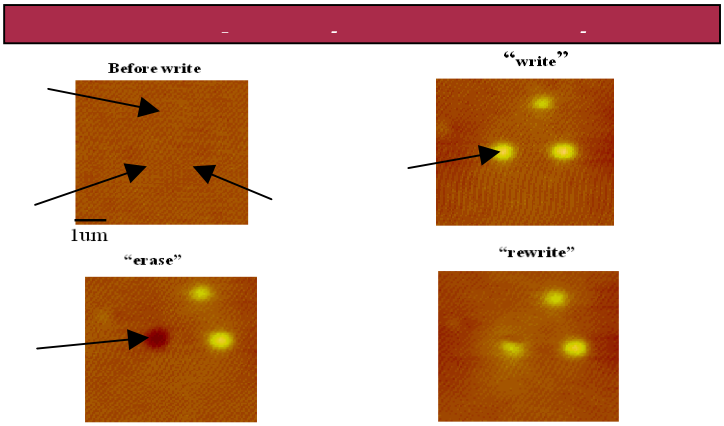
structure of 4AA/PD - to be used if desired



4AA/PD

IRG 2 Molecular Scale Storage by Charge Trapping

In panel (a) the surface potential image obtained from Kelvin probe microscopy is shown of a 2nm film of 4AA/PD vapor deposited onto a Si(100) substrate. Panel (b) shows the surface potential contrast after contacting the film in 3 regions for 1 second. These regions remain charged for about 1 hour. In panel (c) the tip polarity is reversed over a charged domain to neutralize the stored charge. Panel (d) shows the region maybe recharged which demonstrates a reversible process.



PD Note, the images from the informal site visit presentation are clearer, see below. The erase state is actually an oppositely charged region.