

Single Electron Writing in Molecular Charge Storage Films
Silas C. Blackstock

abstract: Polyarylamines (PAAs) are prepared as electronic materials for reversible charge state switching in thin film media. The PAAs are amorphous and can be cast into thin films by spin coating neat or in polymethylmethacrylate (PMMA) polymer. Application of a voltage at an AFM tip in contact with PAA films on SiO₂/Si substrates allows the electrostatic charging of a small domain of PAA molecules in the film. Tip contact with a single PAA molecule is possible in PAA/PMMA mixed films. Under these single molecule charging conditions, it is also possible to control the charge state "written" by the tip in the molecule by controlling the applied voltage. Single electron resolution in electrostatic charging and also in surface potential monitoring of the charge is demonstrated for the first time under conditions where the atomic/molecular nature of the charges created is controlled and known in the film state. Control of the charge state of single molecules with single electron resolution in thin films offers a new capability for the design and development of nanoscale molecular electronic materials.