

Abstract Submitted
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Reliable and Versatile Molecular Electrodes PAWAN TYAGI, DONGFENG LI, STEPHEN HOLMES, BRUCE HINDS — Further advancements of molecular electronics will require a reliable and easily scalable electrode fabrication scheme with dimensional control to molecular lengths. We have produced versatile molecular junction (MJ) with high yield (90%) long device life (>1year) using simple photolithography and thin film methods. The critical electrode dimension is readily set to the length of a molecule by the thickness of an insulator film at a pattern edge. A variety of MJs were prepared by attaching paramagnetic molecular clusters to span the exposed edge of metal-insulator-metal tunnel junctions. Magnetic (Co, NiFe and Ni) and nonmagnetic (Cu, Pd, Ta and Au) metal electrodes and Al₂O₃ insulator were utilized. After molecule attachment ~5000% increase in current over bare tunnel junction current was observed. Control experiments including the use of neat solvents, using junction widths longer than molecules, use of insulating molecules, and the reversible binding of molecule to top electrode confirm the successful fabrication of molecular electrodes. MJs were photoactive producing ~60mV photo voltage with white light irradiation. Large magneto-resistance effects were seen with magnetic electrodes.

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