Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Spectroscopic Characterization of ssDNA Brushes D. Y. PETROVYKH, University of Maryland, College Park, MD and Naval Research Laboratory, Washington, DC, A. OPDAHL, H. KIMURA-SUDA, M. J. TARLOV, NIST, Gaithersburg, MD, L. J. WHITMAN, Naval Research Laboratory, Washington, DC
— We use X-ray photoelectron (XPS) and Fourier transform infrared (FTIR) spectroscopies to quantitatively characterize the structure and conformation of single-stranded DNA (ssDNA) brushes on gold surfaces. Self-assembly of these brushes exploits an intrinsic affinity between blocks of adenine nucleotides and gold surfaces. Using brushes of model block oligonucleotides, d(Tm-An), with systematically varied lengths of the thymine and adenine blocks [d(T) and d(A)], we demonstrate that this immobilization strategy enables independent and deterministic control of the grafting density (lateral spacing) and brush conformation. Quantitative analysis of XPS and IR spectroscopic signatures of the model d(Tm-An) brushes confirms that the d(T) blocks extend away from the surface in a brush-like conformation, at lateral spacing 2-3 times larger (grafting density 5-10 times lower) than in analogous films immobilized via standard thiol linkers. The conventional S-Au attachment strategy requires near-saturation grafting densities to adopt this upright conformation, therefore ssDNA immobilization via d(A) blocks offers a unique pathway to achieve a brush-like conformation at low grafting density.

D. Y. Petrovykh
University of Maryland, College Park, MD and Naval Research Laboratory, Washington, DC

Date submitted: 30 Nov 2005 Electronic form version 1.4