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Orientation of DNA Bases Detected by NEXAFS, XPS, and FTIR D.Y. PETROVYKH, Physics Department, University of Maryland, College Park and Naval Research Lab, Washington, DC, V. PEREZ-DIESTE, Physics Department, University of Wisconsin, Madison, A. OPDAHL, H. KIMURA-SUDA, M.J. TARLOV, National Institute of Standards and Technology, Gaithersburg, MD, F.J. HIMPSEL, Physics Department, University of Wisconsin, Madison, L.J. WHITMAN, Naval Research Lab, Washington, DC — There is increasing evidence that conventional surface characterization methods, including those in ultra-high vacuum (UHV), can be used to understand complex bio-interfaces. We are studying the orientation of DNA bases in self-assembled monolayers of thymine (dT) homo-oligonucleotides on gold in both UHV and ambient environments using a combination of spectroscopic methods. The DNA coverage, chemical composition, and orientation of thymine bases in UHV are determined using near-edge X-ray absorption fine structure spectroscopy (NEXAFS) with fluorescence detection and X-ray photoelectron spectroscopy (XPS). Complementary information about dT orientation in the ambient is obtained with Fourier transform infrared (FTIR) spectroscopy. We observe spectral signatures of oligo(dT) monolayers on Au using all three techniques, including features that can be used to distinguish between different conformations of DNA on the surface. We find that monolayers of thiolated dT 5mers are more ordered than 25mers, and that in both cases the thymine bases are oriented with respect to the substrate.

D.Y. Petrovykh
Physics Department, University of Maryland, College Park and Naval Research Lab, Washington, DC

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