

Abstract Submitted
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Trimethyltin Mediated Formation of Covalent Gold-Carbon Bonds ARUNABH BATRA, Dept. of Applied Physics and Applied Mathematics, Columbia University, NYC, G. KLADNIK, ALOISA Beamline, Elettra Synchrotron, Trieste, Italy, J. MEISNER, Dept. of Chemistry, Duke University, Durham, NC, M. STEIGERWALD, C. NUCKOLLS, Dept. of Chemistry, Columbia University, NYC, D. CVETKO, A. MORGANTE, ALOISA Beamline, Elettra Synchrotron, Trieste, Italy, L. VENKATARAMAN, Dept. of Applied Physics and Applied Mathematics, Columbia University, NYC — Covalent Au-C bond formation via trimethyltin (SnMe_3) precursors has been hypothesized based on recent single-molecule conductance measurements¹. Here, we provide spectroscopic evidence for the formation of Au-C bonds using a trimethylbenzyltin precursor on Au(110) and Au(111) surfaces. From X-Ray photoemission spectroscopy (XPS), we find that the precursor molecule cleaves on both surfaces at temperatures as low as 200K. As substrate temperature rises to 300K, shifts in the C1s and Sn3d XPS spectra indicate the formation of Au-Benzyl and Au-SnMe₃ moieties on the surface. Near-edge X-Ray photoemission spectroscopy (NEXAFS) of the Au-Benzyl system on Au(110) shows a new unoccupied state near E_{Fermi} accompanied by a broadened lowest unoccupied molecular orbital (LUMO). That these features are missing in Au(111) suggests that the Au-C bond formation occurs preferentially on under-coordinated gold surfaces. Lastly, we use core-hole-clock resonant photoemission to understand the dynamics of charge transfer from this broadened LUMO to the underlying Au substrate, and find evidence for sub-femtosecond charge transfer [1] JACS 133, 17160–17163 (2011)

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