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Structural and Electrical Characterization of Flip Chip Laminated ω-functionalized thiols MARIONA COLL, NADINE GERGEL-HACKETT, CURT A. RICHTER, CHRISTINA A. HACKER, NIST — The ability to electrically contact organic materials remains one of the key issues to build high performance organic-based electronic devices. The use of organic molecules as active components in electronics offers a promising alternative for 'more than Moore' devices. Molecules exhibit small size, advanced functionality and can form covalent bonding with semiconductors ensuring more robust devices and also speed integration of molecule-based devices with conventional CMOS technology. However, direct metal vapor deposition of the top contact leads to multiple metal filaments which diffuse through the organic monolayer and can dominate the electrical response. Flip Chip Lamination allows us to fabricate reliable silicon-based molecular electronic structures by forming highly ordered self-assembled bifunctional monolayers on ultrasmooth metal surfaces. Then, these molecular substrates are flipped and bonded to H-Si(111) enabling a detailed characterization of molecules confined between two electrodes. Using polarized backside reflection absorption infrared spectroscopy (pb-RAIRS) we are able to study the geometry, chemical and conformational changes at the interfaces and within the monolayers. Electrical behavior of molecular devices has been evaluated by transition voltage spectroscopy.

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