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Probing molecules in integrated silicon-molecule-metal junctions by inelastic tunneling spectroscopy. WENYONG WANG, National Institute of Standards and Technology, ADINA SCOTT, Purdue, NADINE GERGEL-HACKETT, CHRISTINA HACKER, NIST, DAVID JANES, Purdue, CURT RICHTER, NIST — A hybrid technology where molecular devices are integrated with traditional semiconductor microelectronics is a promising approach for future electronic applications. Key challenges in this area include developing devices in which the molecular integrity is preserved and identifying in-situ characterization techniques to probe the molecules within the completed devices. In this study, we present the first experimental report of inelastic electron tunneling spectroscopy of integrated metal-molecule-silicon devices with molecules assembled directly to silicon contacts. The results provide direct experimental confirmation that the chemical integrity of the monolayer is preserved and that the molecules play a direct role in electronic conduction through the devices. Spectra obtained under varying measurement conditions show differences related to the silicon electrode, which can provide valuable information about the physics influencing carrier transport in these molecule/Si hybrid devices.

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