

Abstract Submitted
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Impact of adsorbed organic monolayers on vacuum electron tunneling contributions to electrical resistance at an asperity contact DIANA BERMAN, MATTHEW WALKER, JACQUELINE KRIM, North Carolina State University — Electrical Contact Resistance measurements are reported for RF MEMS switches situated within an ultrahigh vacuum system equipped with *in situ* oxygen plasma cleaning capabilities. Measurements were performed on Au/Au permanently adhered switches, and functioning Au/RuO₂ switches in the presence and absence of adsorbed monolayers of pentane and dodecane. The data are analyzed to explore how adsorbed molecules in regions close to the contact may impact vacuum tunneling contributions to the experimentally measured resistance: (1) The resistance associated with direct contact in parallel with a vacuum tunneling path, which upon uptake of the monolayer is replaced by the molecular resistance, and (2) A series connection of the direct contact resistance with the molecular layer after adsorption occurs, with the vacuum tunneling path assumed to be negligible. The results favor scenario (1), whereby uptake of the molecular layer effectively shuts down the vacuum tunneling path, which in this case is effectively ~ 30 Ohms in the absence of an adsorbed film. The methods constitute a new and original approach to documenting vacuum tunneling levels in regions of close proximity. Funding agencies: NSF, AFOSR MURI, DARPA.

[1] D. Berman, M. Walker, C. Nordquist, J. Krim, *J. Appl. Phys.*, in press

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