Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Dynamics of intermolecular Auger decay at a surface-chemisorbate interface PIOTR MATYBA, ADRA CARR, CONG CHEN, MARGARET M. MURNANE, HENRY C. KAPTEYN, JILA, Boulder, CO, DAVID L. MILLER, MARK W. KELLER, NIST, Boulder, CO, GUOWEN PENG, MANOS MAVRIKAKIS, Univ. Wisconsin-Madison, STEFFEN EICH, Univ. of Kaiserslautern, Germany — We use ultrafast high harmonic x-ray pulses to follow the relaxation dynamics of the 2p core-hole in Na chemisorbed on graphene/Ni(111).[1] A core-excited Na atom cannot fill the 2p core-hole through Auger decay since the 3s shell has only one electron. In Na dimers or metal however, Auger decay is possible via interatomic or LVV Auger decay since the 3s electrons are shared or form a valence band (VB). The lifetimes of the 2p core-hole in dimers (15+/-8 fs) and metal (51+/-7 fs) are relatively long due to coupling and many body interactions.[2, 3] In a submonolayer of Na on graphene/Ni(111), the 3s electrons do not form a VB but populate the empty π^* state of graphene. Our measurements show that the LVV-like decay is still possible in such a system. Moreover, the lifetime of the 2p core-hole is exceptionally short (<2 fs to 7 fs depending on the coverage) when compared to Na dimers or metal. We conclude that this fast decay is mediated by the graphene and its delocalized π and $\pi*$ electrons, and due to the strong Na-graphene bonding, is akin to Auger rather than to intermolecular Coulomb decay. [1] A. V. Carr et al., in preparation (2013), [2] T. Rander et al., Physical Review A 75 (2007), [3] T. A. Callcott et al., Physical Review B 18, 6622 (1978).

Piotr Matyba
JILA, Boulder, CO

Date submitted: 15 Nov 2013 Electronic form version 1.4