Abstract Submitted for the SES11 Meeting of The American Physical Society

Dianion formation from anion-alkali metal charge exchange reactions: $\mathbf{TCNQ}^- + \mathbf{Na} \rightarrow \mathbf{TCNQ}^{--} + \mathbf{Na}^+$ BYRON SMITH, ROBERT COMP-TON, SERGE OVCHINNIKOV, University of Tennessee, ANNE HOLM, STEEN NIELSEN, University of Aarhus — The interaction of an electron with an anion is characterized by a long-range coulomb repulsion and a short range polarizability attraction giving rise to a coulomb barrier. The permanent addition of an extra electron to a negatively charged anion requires tunneling through the barrier or attachment of the electron over the top of this coulomb barrier followed by disposal of the excess energy. Charge-exchange collisions of an anion with an alkali atom utilize the latter channel to produce permanent dianions with cross sections of ~ 1 Å². We have previously examined the reaction TCNQ- F_4^- + Xe \rightarrow TCNQ- F_4^{--} + Xe^+ and reported a delayed threshold and quantum phase interference effects in the charge exchange cross section.¹ Employing sodium as the collision partner, the cross section is seen to increase with decreasing energy with a threshold below 180 eV (com). A new apparatus has been constructed to allow measurements down to energies below the expected threshold ($\sim 41 \text{ eV}$, laboratory energy based upon a 1 eV second electron affinity). This method has been used to study the reaction $TCNQ^{-} + NA \rightarrow TCNQ^{--} + Na^{+}$ and will provide one of the first measurements of second electron affinities for molecular anions.

¹S. Yu. Ovchinnikov, et al. Phys. Rev. A, 73, 64704(2006)

Byron Smith University of Tennessee

Date submitted: 17 Aug 2011

Electronic form version 1.4