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Inelastic vibrational processes in charge transfers between H/D and molecular ions SARAH L. HECZKO, KIEFFER G. BACANI, RICHARD A. STROM, Department of Physics, Pacific Union College, Angwin CA 94508, USA, VOLA M. ANDRIANARIJAONA, Department of Physics, Pacific Union College, Angwin, CA 94508, USA, DAVID G. SEELY, Physics Department, Albion College, Albion, MI 49224, USA, CHARLES C. HAVENER, Phiscs Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830, USA — Charge transfer on molecule proceeds through dynamically coupled electronic, vibrational, and rotational degrees of freedom. The inelastic vibrational processes, which go along with the reaction, can be experimentally investigated by using H/D systems, which do not allow multi-electron capture. Using the upgraded ion-atom merged-beams apparatus at Oak Ridge National Laboratory, absolute direct charge transfer cross sections for H_2^+ , D_2^+, CO^+, O_2^+, and H_3^+ are measured from keV/u collision energies where the collision is considered "ro-vibrationally frozen" to few eV/u energies where collision times are long enough to sample vibrational modes. The measurements presented here benchmark high energy theory and vibrationally specific adiabatic theory (V. M. Andrianarijaona *et al.*, Phys. Rev. A **84**, 062716, 2011). Research supported by the NASA Solar & Heliospheric Physics Program NNH07ZDA001N, the Office of Fusion Energy Sciences and Division of Chemical Sciences, Geosciences, and Biosciences, the Office of Basic Energy Sciences of the US Department of Energy. VA et al. is supported by the National Science Foundation through Grant No. PHY-106887.

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