Total Cross Section Measurements and Velocity Distributions of Hyperthermal Charge Transfer in $\text{Xe}^{2+} + \text{N}_2$ \(^1\) MICHAEL HAUSE, Boston College Institute of Scientific Research, BENJAMIN PRINCE, RAYMOND BEMISH, Air Force Research Laboratory — Guided-ion beam measurements of the charge exchange (CEX) cross section for $\text{Xe}^{2+} + \text{N}_2$ are reported for collision energies ranging from 0.3 to 100 eV in the center-of-mass frame. Measured total XS decrease from 69.5±0.3 Angstroms\(^2\) (Angs.) at the lowest collision energies to 40 Angs.\(^2\) at 100 eV. The product $\text{N}_2^+$ CEX cross section is similar to the total CEX cross section while those of the dissociative product, $\text{N}^+$, are less than 1Angs.\(^2\) for collision energies above 9 eV. The product $\text{N}_2^+$ CEX cross section measured here are much larger than the total optical emission-excitation cross sections for the $\text{N}_2^+$ (A) and (B) state products determined previously in the chemiluminescence study of Prince and Chiu suggesting that most of the $\text{N}_2^+$ products are in the X state. Time-of-flight (TOF) spectra of both the $\text{Xe}^+$ and $\text{N}_2^+$ products suggest two different CEX product channels. The first leaves highly-vibrationally excited $\text{N}_2^+$ products with forward scattered $\text{Xe}^+$ (LAB frame) and releases between 0.35 to 0.6 eV translational energy for collisions below 17.6 eV. The second component decreases with collisional energy and leaves backscattered $\text{Xe}^+$ and low-vibrational states of $\text{N}_2^+$. At collision energies above 17.6 eV, only charge exchange involving minimal momentum exchange remains in the TOF spectra.

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Michael Hause
Boston College Institute of Scientific Research

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