

AU Le Padellec, A, Mitchell, JBA, Al-Khalili, A, Danared, H, Kallberg, A, Larson, A, Rosen, S, af Ugglas, M, Vikor, L, Larsson, M

TI Storage ring measurements of the dissociative recombination and excitation of the cyanogen ion  $CN+(X-1 \text{ Sigma}(+))$  and a  $(3)Pi, \nu=0$

SO JOURNAL OF CHEMICAL PHYSICS

LA English

DT Article

ID HIGH-RESOLUTION MEASUREMENT; ABSOLUTE CROSS-SECTIONS; DIELECTRONIC-RECOMBINATION; RADIATIVE LIFETIMES; LYING STATES; ENERGY CO+; CURVES; CLOUDS; ESCAPE

AB Absolute cross sections and rate coefficients were measured for the dissociative recombination of  $CN+(X (1)Sigma(+))$  and a  $(3)Pi, \nu=0$  with electrons using the heavy ion storage-ring CRYRING at Stockholm University. The  $a (3)Pi$  State that lies only 0.08 eV above the  $X(1)Sigma(+)$  ion ground state is most certainly populated in the ion beam injected into CRYRING, as this is a long-lived excited state. Over the 1 meV-3 eV energy range that was investigated, two energy dependencies were found for the cross sections, namely  $E^{-1.05}$  below 0.1 eV and  $E^{-1.41}$  above 0.4 eV. The energy domain 0.1-0.3 eV exhibits a resonant structure. Branching fractions over the final atomic product states were determined using a position sensitive imaging detector. Thermal rate coefficients are deduced from the measurements and the efficiency displayed by the dissociative recombination mechanism is typical of that of a diatomic ion ( $3.4 \times 10^{-7} \text{ cm}^3 \text{ s}^{-1}$  at room temperature). Cross sections for the dissociative excitation process are also reported and their magnitude at the plateau are unusually large. This may be explained by the number of potential curves which can be populated at moderate collision energy ( $<10 \text{ eV}$ ) for the  $CN+$  ion. (C) 1999 American Institute of Physics. [S0021-9606(99)00201-9].

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NR 56

TC 7

PU AMER INST PHYSICS

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SN 0021-9606

J9 J CHEM PHYS

J1 J. Chem. Phys.

PD JAN 8

PY 1999

VL 110

IS 2

BP 890

EP 901

PG 12

SC Physics, Atomic, Molecular & Chemical

GA 153NT

UT ISI:000077839700021