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### Publication Date

1979-05-01



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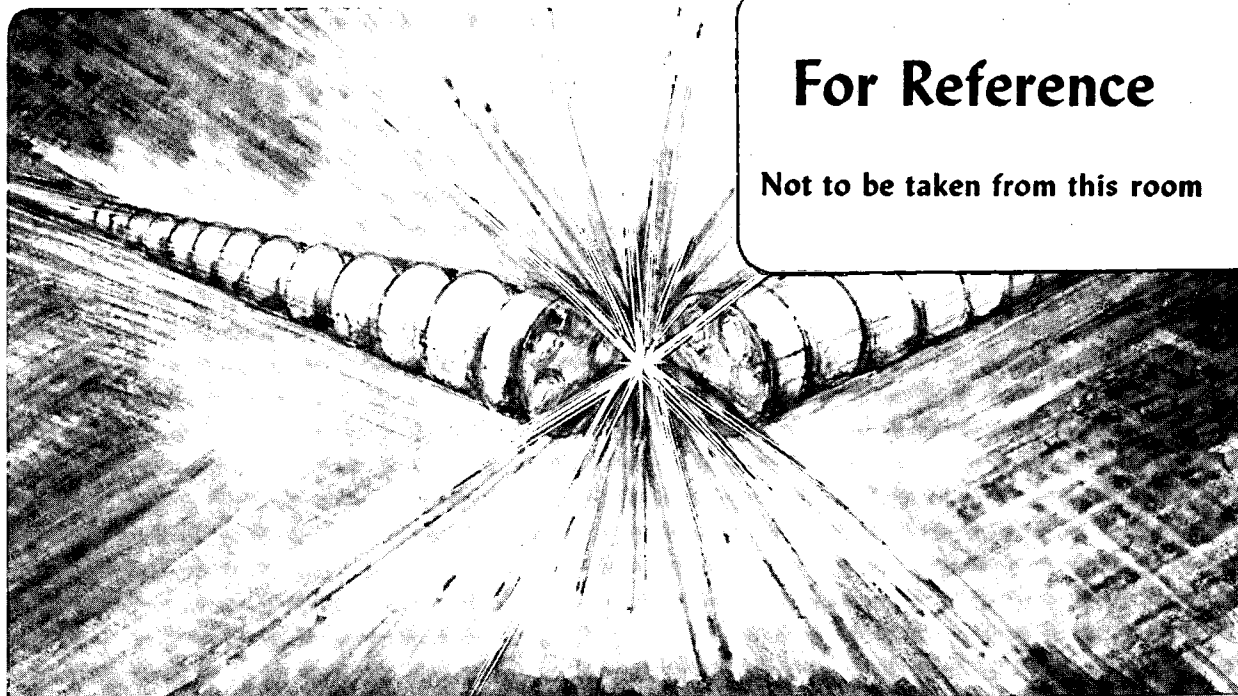
## Accelerator & Fusion Research Division

To be presented at the Nagoya Seminar on Atomic  
Processes in Fusion Plasmas, Nagoya, Japan,  
September 5-7, 1979

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May 1979



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May 7, 1979

LBL-9263

## CHARGE-TRANSFER AND IMPACT-IONIZATION CROSS SECTIONS FOR HIGHLY STRIPPED CARBON AND NIOBIUM IONS INCIDENT ON ARGON AND HYDROGEN\*

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We have measured the cross sections for net impact ionization of H<sub>2</sub> and Ar targets by 290 keV/amu and 1.1 MeV/amu C<sup>+q</sup> ions for q = 4-6, and by 3.4 MeV/amu Nb<sup>+q</sup> ions for q = 23-36. We have also measured charge-transfer cross sections for these projectiles in H<sub>2</sub> and Ar.

The net impact-ionization cross section,  $\sigma_1$ , is the weighted sum,  $\sum n\sigma(n)$ , where  $\sigma_n$  is of the cross section for removal of n target electrons. This cross section can be very large, especially for an Ar target, where multiple ionization is an important process. Typical values for the net ionization cross section are  $3.3 \times 10^{-15} \text{ cm}^2$  for C<sup>+6</sup> in Ar at 1.1 MeV/amu,  $1.0 \times 10^{-14} \text{ cm}^2$  for Nb<sup>+34</sup> in H<sub>2</sub> at 3.4 MeV/amu, and  $3.4 \times 10^{-14} \text{ cm}^2$  for Nb<sup>+34</sup> in Ar at 3.4 MeV/amu. Our results for the net ionization cross section are in reasonably good agreement with the weighted sum of recently measured  $\sigma(n)$ .<sup>1</sup>

The sum of the charge-transfer and impact-ionization cross sections for a projectile X<sup>+q</sup> in H is the cross section for electron loss from the hydrogen atom. We use the above results (divided by a factor of 2 for comparison with calculations for H atoms) to extend to large q values and to different ion species the experimental confirmation of our previously determined theoretical/experimental scaling rule<sup>2</sup> for electron loss from a hydrogen atom in collision with a heavy, highly stripped ion.

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\*This work was supported by the Fusion Energy Division of the U.S. Department of Energy under contract No. W-7405-ENG-48.

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<sup>1</sup>C. L. Cocke, submitted to Physical Review.

<sup>2</sup>R. E. Olson, K. H. Berkner, W. G. Graham, R. V. Pyle, A. S. Schlachter, and J. W. Stearns, Physical Review Letters 41, 163 (1978); and K. W. Berkner, W. G. Graham, R. V. Pyle, A. S. Schlachter, and J. W. Stearns, submitted to XI ICPEAC (Kyoto, 1979).

This report was done with support from the Department of Energy. Any conclusions or opinions expressed in this report represent solely those of the author(s) and not necessarily those of The Regents of the University of California, the Lawrence Berkeley Laboratory or the Department of Energy.

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