§3. Slow Collisions between N^{7+} Ions and H or He Atoms

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In our continuing effort to contribute to the data basis of atomic collision processes we have studied electron transfer and excitation in collisions between N^{7+} ions and H or He atoms. These calculations are performed within the close-coupling method with atomic-orbital basis sets. Their main thrust lies in the determination of cross sections for the population of high-n states of N^{6+} in these collisions. Such results have been derived earlier for collision with hydrogen on the basis of a simplified model [1] in which only selected couplings between (n, l, m) and (n', l', m') states have been considered. Recent observations [2] in the JET diagnostics group seem to be slightly inconsistent with results from the earlier theoretical work.

As it turns out for N^{7+}– H collisions, the transfer cross sections from the simplified model are confirmed in our new study which includes *all* couplings within the basis sets. Such studies have been performed for a small number of systems, see our review [3] and references therein. They are believed to be very reliable except for the cross sections for transitions into the states with the highest principal quantum number n that is included in the basis. A subset of results for N^{7+}-H collision is shown in figure 1. The full set of results for this system will be discussed elsewhere, as well as the results for high-n population in N^{7+}– He collisions for which there is as yet no other information available.

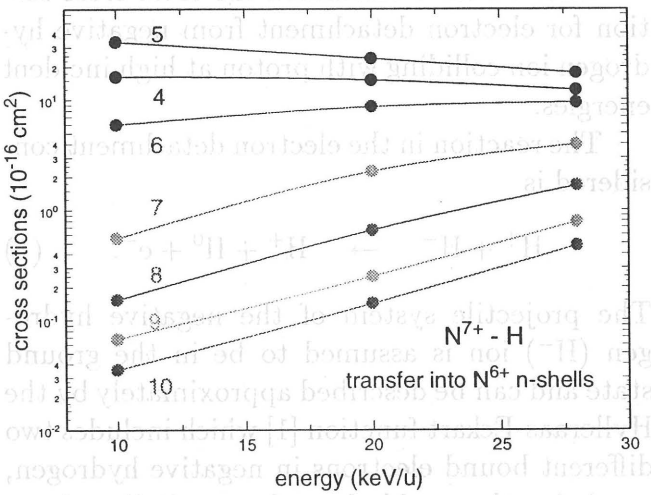

Figure 1: Calculated cross section in N^{7+}– H collisions.

Other collisions that are being studied now include slow N^{4+}– H and Be^{2+}– H collisions. Such work is being done as part of an IAEA Coordinated Research Project on Charge Exchange Cross Section Data for Fusion Plasma Studies.

References

[1] Fritsch, W., Phys. Rev. A **30** (1984) 3324.

[2] M. von Hellermann, private communication.

[3] Fritsch, W., Tawara, H., NIFS-DATA-39 (1997) 89.