Associative Ionization Reactions and Secondary Reactions of Ions formed in Magnetically Confined Plasmas*

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Associative Ionization between thermal energy ground-state species, i.e.,

$$A + B \longrightarrow AB^+ + e$$

produces molecular ions which are energetically forbidden from becoming neutralized by the normal dissociative recombination with electrons. A number of such systems are now known, a brief review of which will be given, along with abolute cross sections where they are known. Among the best understood of the associative ionizers is the Uranium atom. Experiments have been performed in which a Uranium atom beam crosses a magnetic bottle field in a vacuum to which O_2 or N_2O has been added, Both primary and secondary ions are mass spectrometrically detected upon leakage from the magnetic mirror at one end of the bottle field. With N_2O added, the UO_2^+ ion is apparently formed from the $UO_3^+ + N_2O$ reaction whose cross section can be estimated. With O_2 added, the UO_3^+ ion is formed, and its appearance suggests that the accepted energetics of the Uranium oxygen system may be in error.

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