Abstract Submitted
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Molecular Ion Effects in IEC Modeling[1] GILBERT EMMERT, JOHN SANTARIUS, Fusion Technology Institute, University of Wisconsin — A 1-D model for the effect of various molecular and atomic processes (charge exchange, ion impact ionization, and dissociative processes) between deuterium ions (D^+, D_2^+, and D_3^+) and the background gas on the performance of spherical, gridded IEC devices has been developed. Ions pass through the anode grid primarily as an arbitrary mixture of D^+, D_2^+, and D_3^+ ions and, while being accelerated by the electrostatic potential, interact with the background gas to produce a source of cold ions (D^+ and D_2^+) through interactions with the background D_2 gas. These cold ions are accelerated by the potential and produce additional cold ions through interactions with the background gas. A formalism has been developed which includes the bouncing motion of ions in the potential well and sums over all generations of cold ions. This leads to a set of coupled Volterra integral equations. The integral equations are solved numerically to yield the energy spectrum of the ion and fast neutral flux; the resulting neutron production rate is calculated. Parametric surveys of the effect of the ion mixture in the source region and comparison with experimental data for the Wisconsin IEC devices will be presented.

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