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A Study of the Ionization of Deuterium Gas by Pyroelectric Crystals BRYCE TAYLOR, North Carolina School of Science and Math, STEPHEN SHAFROTH, UNC, WERNER TORNOW, Duke/TUNL — Pyroelectric crystals produce a stream of electrons or positive ions when heated or cooled in a near-vacuum environment. We studied the behavior of these crystals in deuterium gas. We look at what portion of the positive ion beam consists of D_2^+ and what portion is D^+. Since D_2^+ contains only half the energy of D^+ per deuterium atom after traversing a given potential difference, it has a notably lower cross-section for fusing than D^+ does, which lowers neutron yield. Looking at the equivalent dissociation question for H_2 gas, we find that <0.1% is ionized as H^+ based on magnetic deflection of the ions. Analogous results are assumed for D_2. Furthermore, we present a new phenomenon in which groups of positive ions arrive at the detector at the same time similar to multiple peaks present in electron spectra reported by Brownridge and Shafroth.[1] We provide a new theory on the workings of pyroelectric crystals based on the expulsion of gas trapped inside the crystal to explain these findings and other results. Funding provided by grant DOE DE-FG52-09NA29465.

[1]J. D. Brownridge, S. M. Shafroth, D. Trott, B. Stoner, and W. Hooke, Appl. Phys. Lett. **78**, 1158 (2001)

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