**N (\( ^2P \)) Production in electron-N\(_2\) Collisions.**

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**Introduction.**

Previously, we have studied the production of metastable atoms and molecules using a selectively sensitive detector developed in our laboratory [1-4]. The detector consists of a cryogenically cooled surface on which a rare gas is continuously deposited forming a solid layer. A pulsed magnetically collimated, electron beam impacts the target gas, and the resulting neutral fragments drift towards the detector. The metastable species form excimers with, or transfer excitation to, the matrix which quickly radiates and the resultant photons pass through a 10 nm bandpass filter centered on 340 nm and are detected by a cooled photomultiplier. (This filter also transmits the N\(_2\) C\(^3\)Π\(_u\) \(-\) B\(^3\)Π\(_g\) (0,0) 337 nm Second Positive band) The processes may be represented by:

\[
e + N_2 \rightarrow N (^2P) + N + e'
\]

N\(^{2P}\) + Xe(Matrix) \(\rightarrow\) Xe[N\(^{^2P}\)]* \(\rightarrow\) h\(\nu\)(347 nm)

Time-of-flight (TOF) spectra are obtained using a multichannel scaler, where the zero of time scale is indicated by a prompt photon peak produced from the excitation of target molecules. In the present work production of metastable N\(^{2P}\) atoms has been investigated using a solid xenon matrix at a temperature of approximately 15K

**Apparatus**

**Time of Flight Data for N(\(^2P\))**

100 eV impact. Data using 340 nm filter

**Released Kinetic Energy**

**Excitation Function Data.**

\[\text{C}^3\Pi_u \rightarrow \text{B}^3\Pi_g (0,0) \text{337nm band.}\]

**Suggested Mechanisms:**

**Direct Excitation:**

\[
e + N_2 (X' \Sigma^+_g, v = 0) \rightarrow e' + N_2^+ (B' \Sigma^+_u) \rightarrow N(^2P) + N(^2S) \quad (1)
\]

\[
e + N_2 (X' \Sigma^+_g, v = 0) \rightarrow e' + N_2^+ (C' \Pi_u) \rightarrow N(^2P) + N(^2S) \quad (2)
\]

**Pre-Dissociation Mechanism:**

\[
e + N_2 (X' \Sigma^+_g, v = 0) \rightarrow e' + N_2^+ (b' \Sigma^+_u, v) \rightarrow N(^2P) + N(^2S) \quad (3)
\]

**References:**


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