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Neutral energy distribution in the cathode fall of direct-current glow discharges TSUYOHITO ITO, Osaka University, MARK CAPPELLI, Stanford University — Energetic neutrals are formed in the cathode fall of dc glow discharges through collisions with accelerated ions. These energetic neutrals contribute to secondary electron emission, electrode erosion, and discharge gas heating. In this study we describe direct measurements and Monte Carlo simulations of the energy distribution of energetic neutrals in an argon dc glow discharge. The measurements are performed by time-of-flight analysis of neutrals escaping through a cathode orifice. The experimental results are found to be in good agreement with the Monte Carlo simulations. A preliminary sensitivity of the MC simulations to angular scattering in ion-neutral collisions suggests that improved agreement can be obtained by including more complex modeling of the charge exchange collision processes. The results also indicate that commonly-used theories for the production of energetic neutrals through charge exchange in the cathode fall do not capture the neutral energy distribution over the range of discharge voltage studied.

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