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Energy Distributions of Ion Drift to the Cathode in a DC Microdischarge TSUYOHITO ITO, MARK CAPPELLI, Stanford University — The cathode sheath serves many important functions in a discharge. A DC microdischarge has a relatively high ratio of cathode surface area to volume. Understanding the structure of the sheath and its associated physical phenomena is even more critical to the understanding of microdischarges. In this study, the ion energy distributions (IED) in the cathode sheath of a DC microdischarge were measured. The pressure-gap distance product was fixed at 1 cmTorr with a pressure from 2 Torr to 20 Torr. The measured IED was analyzed by the expanded theory of Davis and Vanderslice. The results indicate that a scaling law of pressure-normalized current density is no longer applicable. The background gaseous temperatures expected from IED and the collisional Child law is seen to increase with increasing current. Moreover, the expected temperature shows good agreement with that estimated by Doppler broadening via laser absorption spectroscopy. Given this result, it is concluded that the expanded theory might accurately describe microdischarges at least over the discharge conditions studied here.

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