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Ion velocities in an electronegative presheath MARK SOBOLEWSKI, YICHENG WANG, AMANDA GOYETTE, National Institute of Standards and Technology — Under certain conditions in radio-frequency (rf) discharges, features in ion energy distributions (IEDs) measured at an electrode depend very sensitively on ion velocities far upstream, in the presheath. By measuring such distributions together with sheath voltage waveforms, presheath ion velocities can be determined and long-standing controversies regarding presheath transport can be resolved. For rf-biased, inductively coupled plasmas in CF_4 gas, we determined the presheath velocities of all significant positive ions. Velocities were significantly lower than those predicted by electropositive models. These results contradict the claim that negative ions are confined to a core electronegative plasma surrounded by an electropositive peripheral plasma and presheath. Also, they indicate that models that neglect the effect of negative ions in presheaths will under certain conditions yield dramatically inaccurate predictions for IEDs, average ion energy, and rf bias power.

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