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Modeling the influence of interelectrode spacing in the Pulsed Discharge Nozzle JEROME REMY, European Patent Office, NL, BART BROKS, International Marketmakers Combination, NL, WOUTER BROK, OTB engineering, NL, JOOST V.D. MULLEN, Eindhoven University of Technology, NL, ABDESSAMAD BENIDAR, LUDOVIC BIENNIER, PALMS laboratory, Universite de Rennes, F, FARID SALAMA, NASA AMES Research Center, USA — The Pulsed Discharge slit Nozzle (PDN) source was designed to produce and cool molecular ions, creating an astrophysically relevant environment in the laboratory. Using a discharge model applied to this system, a parameter study of the influence of the interelectrode distance on the plasma properties is carried out to optimize the yield of molecular ions and radicals in the PDN source. The model describes the electron density and energy, as well as the argon ion and metastable atom number density for various interelectrode distances. The results reveal that, by increasing the interelectrode distance, a positive column forms between the electrodes, thereby confirming the glow-discharge nature of the plasma. The positive column however does not contribute significantly to the formation of metastable argon atoms, and no enhanced molecular ionization is thus to be expected from an increase in said distance. The simulation results show that the PDN source might be less efficient for longer column lengths; they also provide key insight into the characteristics of interstellar species analogs in laboratory experiments.

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