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Threshold behavior of the magnetized arc in two-stage pulsing microcathode arc thruster.[1] DENIS ZOLOTUKHIN, KEIR DANIELS, MICHAEL KEIDAR, The George Washington University — The concept of two-stage microcathode arc thruster implies the preliminary production of almost fully-ionized metal plasma by the first stage based on pulsing vacuum arc, and acceleration of this plasma by the second stage, in order to achieve higher thrust and thrust-to-power ratio. A second stage based on applied-field magneto plasma dynamical (MPD) approach looks promising since it allows accelerating quasi-neutral plasma without using low-transparent accelerating grids, high voltages, or additional power-consumable electron sources for charge neutralization. We found that being sufficiently magnetized by a dc magnetic field having both axial and radial components, such two-stage pulsing vacuum arc discharge demonstrate a threshold behavior: such parameters as power dissipating by the second stage, charge of expelling ions, and ion-to-arc ratio rapidly grow at certain threshold dc voltage applied between the cathode of the first-stage microcathode arc thruster and the accelerated electrode. Without magnetic field, no threshold behavior was observed for the same thruster construction. Such effect can be used to controllably improve thrust and thrust-to-power ratio in such thrusters.

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