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A hydrodynamic model of ablating arc discharge in atmospheric pressure ADNAN MANSOUR, KENTARO HARA, Texas A&M University — A one-dimensional fluid plasma model has been developed to investigate ablating carbon arc discharge in atmospheric pressure conditions [1]. The multispecies model simulates the coupled chemistry and physics of the ablating arc, including plasma-material interactions, such as evaporation and deposition rates, and interspecies interactions, such as reactions and collisions. A model for predicting the size of the cathode deposit has been proposed based on the principal of energy minimization, namely, there is an optimal deposit area that minimizes the energy lost due to radiation and re-evaporation for a given electron current. The results have shown good qualitative agreement with experimental results, exhibiting transition between high and low ablation rates for different conditions. It is hypothesized, based on the numerical results, that the radiative heat transfer between the anode and the cathode plays an important role in determining the electrode temperatures, potentially explaining the enhanced ablation observed in experiment.

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