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Optical Analysis of High Pressure Microplasma Glow and Arc Discharges NOAH LATHAM, GABE XU, University of Alabama in Huntsville, CARL SANDERSON, UAH Systems Management and Production Center, BRETT HOKR, SMDC, Redstone Arsenal, SMDC, REDSTONE ARSENAL COLLABORATION, UAH SMAP CENTER COLLABORATION, UAH COLLABORATION
— This work presents an analysis of high-pressure microplasma discharges in He-Ar mixtures. The long term objective of this project is to use glow discharges as a gain media for lasing. A glow discharge is desired for such operations due to its uniform and stable nature. However, in atmospheric pressures, arc discharges are significantly more common. Arcing is much less voluminous and can be destructive to electrodes over time. Thus, discerning glow discharges from arc while also maximizing the number of metastables is critical. Determining plasma states visually is inaccurate and subject to bias. Optical Emission Spectroscopy (OES) is used to examine the argon metastable population and is explored as a way to distinguish between the different plasma states. Experiments were conducted at high pressures (740-760 torr), .5-5 percent argon content and an electrode distance of around 3 mm, in which both glow and arc were achieved and observed with OES. Certain argon wavelengths notably changed in intensity between discharges. In addition to metastable population, electron temperature and density will be found using the cross-point method for broadening of hydrogen Balmer lines [1]. [1] J. Torres et al., J. Phys. D: Appl. Phys. 36 (2003)

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