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Diagnostics of a Supersonic Plasma Jet Reactor with Secondary Discharge JAMI MCLAREN, Department of Mechanical Engineering – University of Minnesota, LENKA ZAJICKOVA, Department of Physical Electronics – Masryk University, Brno, Czech Republic, JOACHIM HEBERLEIN, Department of Mechanical Engineering – University of Minnesota — We have used electrostatic probe measurements to determine values of floating potential, electron temperature, and ion density near the substrate in a supersonic plasma jet deposition system. This system involves a plasma jet expanding to supersonic speeds into a chamber at a pressure of 3 torr. To enhance the deposition, a secondary discharge is superimposed over the plasma jet by applying a bias to the substrate with respect to the grounded torch nozzle anode. Probe measurements have been executed for varying substrate bias, torch power, and plasma composition to determine how these deposition conditions affect the measured plasma parameters, which are assumed important for superhard B-C-N film deposition. The diagnostics reveal that ion density is enhanced by increasing torch power and positive substrate bias, the electron temperature is decreased by introducing hydrogen to the plasma jet, and the plasma floating potential increases linearly with positive substrate bias while remaining approximately constant with negative bias. The implications of these measurements for superhard film deposition in our system will be discussed.

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