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Atmospheric Pressure DC and RF plasmas for materials processing DAVID STAACK, Drexel University, BAKHTIER FAROUK, Drexel University, ALEXANDER GUTSOL, Drexel University, ALEXANDER FRIDMAN, Drexel University — Atmospheric pressure discharges have been characterized for their applications to low cost materials processing and micro-fabrication. A challenge in using atmospheric pressure plasmas is creating stable, non-thermal, uniform discharges and preventing the transition to an arc. Such discharges can be created; however, as so called microplasmas with dimensions less than 1mm. Using discharge visualization, voltage-current measurements, and optical emissions spectroscopy the characteristics of DC and RF discharges were measured. The discharges operate as pressure and temperature scaled versions of the familiar low pressure normal glow discharge. The DC discharges operate with normal current density and constant electric field in the positive column. The RF discharges are observed to operate in alpha and gamma modes. Discharges were studied in a variety of gases including, Air, Nitrogen, Hydrogen, Helium, and Argon. Analysis of the spectra emitted by the N_2 2^{nd} positive system indicates gas temperatures in the range of 300K to 2000K depending on gas composition and discharge power. Vibrational temperatures were measured as high as 5000K indicating non-thermal plasma discharges. Using methane-hydrogen mixtures a:C-H coatings of various qualities have been deposited and characterized using Raman spectroscopy.

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