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Characterization of microplasmas and nanoplasmas in ambient and above atmospheric pressure liquids and gases DAVID STAACK, ADITYA CHITRE, Texas A&M Mechanical Engineering — DC glow discharges, DC corona discharges, and nanosecond pulsed corona discharges are investigated in various high density liquids and gases. The discharges are characterized by microscopic visualization, voltage-current measurements, and optical emission spectroscopy. The plasma are investigated with regards to their small feature size, high energy density properties, discharge scaling laws, and instabilities. For operation in gases above atmospheric pressure the DC glow microplasma discharges behave as pressure scaled version normal glow discharges though there are significant temperature effects and the ionization overheating instability becomes more prevalent at higher pressures. Energy densities in the plasmas may range to as high as 10^{26} J/m^3 in pulsed and transient high density discharges. Temperatures range from near ambient to thermal plasma conditions depending on increasing with operating density and pulse duration. In pulsed high energy density operation in liquids and high pressure gases a short ($\sim$50 ns) transition from non-thermal to thermal regime is observable. For operation in liquids and very high pressure gases discharge features $\sim$ 200 nm in size are apparent leading to the possibility of direct write nanofabrication by PECVD and plasma etching techniques using such nanoplasmas.

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