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Direct liquid droplet injection for PECVD[1] D. OGAWA, M. GOECKNER, A. SRA, UT Dallas, R. TIMMONS, UT Arlington, L. OVERZET, UT Dallas — Plasma enhanced chemical vapor deposition (PECVD) is a versatile technique for depositing thin films. For common PECVD, vapor phase precursors have been required. This limitation has led to several methods for allowing the use of low-vapor pressure precursors; for example, entrainment of the precursor vapor in a heated gas flow using bubblers or vaporization sources is common. We are using a new approach, mixing the low vapor pressure precursor into a high vapor pressure solvent and directly injecting the mixture into the low pressure plasma environment as micro-droplets using an automotive fuel injector. We have gone as far as to inject nanoparticles of iron into the plasma by suspending them in hexane (or ethanol). In fact, we believe that metals, dielectrics, superconductors, aromatics, proteins, viruses, etc. could all potentially be injected into low pressure plasma environments using this simple and effective technique. Control over the liquid injection is possible using either the differential pressure across the fuel injector or the time the injector is open. The resulting films formed by the plasma decomposition of the high vapor pressure fluid contain the nanoparticles suspended in the film matrix. We will show that the deposited film depends on the pressure, injection rate and plasma conditions.

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