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Microcathode Sustained Discharges for the generation of DC, non-thermal plasmas at high gas pressure[1]

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It is now well known that non-thermal DC plasmas can be generated and maintained in high pressure gases in small - hundreds of micron-sized - geometries. One such configuration, a MicroHollow Cathode Discharge (MHCD), orginally investigated by Schoenbach and colleagues (KH Schoenbach, et al, Plasma Sources Sci. Technol. **6**, 468 (1997)), consists of a metal/dielectric/metal sandwich through through which a central hole is pierced. The diameter of the hole and the thickness of the sandwich are each some 100's of microns. Larger volume plasmas can be generated by placing a third, positively biased electrode some distance (1 cm) away, in which case the MHCD can act as a plasma cathode. This configuration is called a MicroCathode Sustained Discharge or MCSD (RH Stark and KH Schoenbach J. Appl. Phys. **85** 2075 (1999)). This talk will focus on the properties of the MCSD - its initiation and its electrical properties - and on the properties of the plasma generated in the MCSD volume. Experimental and numerical results for discharges in rare gases and in rare gas/oxygen mixtures at pressures up to atmospheric will be used to illustrate that the plasma generated in the MCSD is similar to a positive column plasma, with a low electric field and low to moderate gas temperature. The plasma conditions in the MCSD are suitable for the generation of large densities of radical species, such as oxygen molecules in the singlet delta metastable state (G. Bauville, et al, Appl. Phys. Lett. **90**, 031501 (2007)).

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