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## **Non thermal plasma sources and emerging applications**

Non thermal / Low pressure plasmas have a unique place in processing of functional materials. These plasmas are widely used for various industrial processes including thin film deposition by Chemical Vapour Deposition (CVD) and Physical Vapour Deposition (PVD). These plasmas have the ability to generate chemically reactive species at low temperature which is due to the non-equilibrium nature of the plasma state. Due to high internal energy of low-pressure plasma, processes that are thermodynamically allowed but kinetically hindered in a conventional process, proceed with a high rate under plasma conditions.

Among the plasma sources that have been developed for processing of various functional materials, microwave and radio frequency based non-thermal plasma sources are attracting a lot of attention because of their inherent superiority over other kinds of plasmas. These plasma sources can be operated in a varied range of pressures starting from 10<sup>-5</sup> mbar to 1 atmosphere. The promising applications of these high frequency plasmas have been appearing in the fields of chemical processes and semiconductor manufacturing. Applications include surface deposition of all types including Diamond / Diamond like Carbon (DLC) coatings, etching of semiconductors, promotion of organic reactions, etching of polymers to improve bonding of the other materials etc.

Starting with the introduction regarding types of plasmas that are being used for processing of materials, this talk will discuss fundamentals of RF and microwave based non-thermal plasma generation and plasma sources such as capacitively coupled RF Plasma (CCP), large area inductively coupled plasma (ICP), fused hollow cathode based atmospheric pressure glow discharge (APGD) plasma and Microwave Electron Cyclotron Resonance (ECR) plasma that are developed using RF and microwave radiations. The emerging applications of these sources will also be discussed.

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