DEVELOPMENT OF DBD BASED EXCIMER SOURCES AND OPTIMIZATION STUDY OF DISCHARGE PARAMETERS

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High-pressure, non-thermal, non-equilibrium plasma sources based on dielectric barrier discharges (DBDs) are increasingly being used in various novel applications[1] but the underlying discharge mechanism is not very clear. We have developed three types of DBD cells. In this work, the xenon, argon and helium gas filled coaxial DBD cells have been studied at different working conditions. In the DBDs the in-situ diagnostics are not possible due to the small geometries and hence electrical modeling and simulation of DBDs became important to get the characteristics of discharge parameters which are not measurable during experiments such as discharge gas voltage, dielectric barrier voltage, memory charge, discharge current and discharge impedance etc. Recently we have made some efforts to understand the discharge phenomenon in the DBDs based on an equivalent electrical circuit model[2], which enables electrical characterization of DBDs. Analysis is carried out in order to obtain the internal discharge parameters including variable discharge impedance which is not measurable during the experimentation processes. From the experimental results and equivalent electrical circuit, the dynamic nature of equivalent capacitance, has also been reported[3] that has been further investigated. The relative intensity analysis of the Xe continuum peak at wavelength 172 nm in the optical emission spectra of VUV region is also carried out. Approximately three times increment in radiation is observed in pulse excitation than those of sinusoidal excitation which infer pulsed excitation of DBD sources are advantageous for excimer light sources.

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* The work has been supported by CSIR Network Programme (NWP0024).