**Space and Time resolved plasma density estimated from** **Hα/OI atomic lines generated by nanosecond discharge in liquid water**

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Non-equilibrium plasmas in liquids generated by nanosecond high voltage pulses have found use in various applications such as water treatment, electrolysis or biomedicine [1]. The dynamics of such discharges are very complex and highly dependent on experimental conditions such as electrode geometry, high voltage (HV) polarity, HV pulse risetime and duration, impedance matching, liquid conductivity and presence of vapor bubbles [2]. Understanding the complex dynamics and chemical kinetics of this highly non-equilibrium discharge requires the knowledge of plasma parameters with high spatial and temporal resolutions. In this work, the optical emission from nanoseconds pulsed plasma generated by 175 kV HV pulse applied to the tungsten anode tip is monitored and analyzed. Electron number densities are estimated from the broadening and shifts of hydrogen and oxygen atomic lines measured by a fast imaging ICCD spectrometer. The initial spectra show a broad band continuum followed by hydrogen Balmer and atomic oxygen lines during later phases. The line profiles are extracted from the modeled continuum to get the spectral line shape. Temporal and spatial electron number densities notably evolve with time 2.1 × 1020 cm-3 – 6 × 1018 cm-3 from 30 ns to 450 ns with only slight density variation with the distance from the anode tip for a particular time. The results are consistent with images taken with high temporal (ns) resolution using either an ICCD spectrometer (0th diffraction order) or a 4-channel ICCD imaging device.

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References

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