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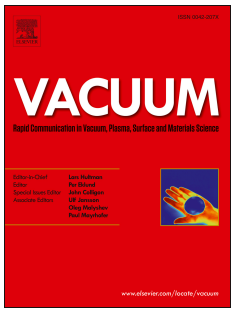

Electron temperature and density measurement of a dielectric barrier discharge argon plasma generated with tube-to-plate electrodes in water

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Electron temperature and density measurement of a dielectric barrier discharge argon plasma generated with tube-to-plate electrodes in water

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Abstract: A dielectric barrier discharge argon plasma was generated with tube–to-plate electrodes in the water by a sinusoidal excitation voltage at atmospheric pressure. Time-averaged optical emission spectroscopy was used to measure the plasma parameters, of which the rotational temperature of OH was obtained by comparing the simulated spectrum with the measured spectrum at the $A^2\Sigma^+ \rightarrow X^2\Pi$ band transition and the electronic excitation temperature was determined by Boltzmann's plot method. Furthermore, the emission intensity ratio of atomic argon lines λ = 811.5 nm to λ= 750.4 nm was used to determine the electron temperature and the Stark broadening of the hydrogen Balmer H_α line was applied to measure the electron density. It has been found that the electron temperature and density in this argon plasma were in the range of 1.02-1.43 eV and on the order of 10^{14} cm^{-3}, respectively, and the excitation temperature, rotational temperature, and electron density increase with the increase of applied voltage. Besides, the properties of the argon dielectric barrier discharge were also studied by electrical diagnosis.

Keywords: Dielectric barrier discharge, Conduction current, Electron temperature, Electron