SPATIAL DISTRIBUTION OF MICROPLASMA IN SMALL DISCHARGE GAPS

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Microplasma proved to be an efficient and economical solution for a series of applications such as NOx removal, indoor air treatment, sterilization of bacteria or surface treatment of polymers. Moreover among nonthermal plasma technologies microplasma has advantages due to its small size of reactor and power supply. Our microplasma is a dielectric barrier discharge at atmospheric pressure. Emission spectra were measured by an ICCD camera, and a spectrometer to which was attached a fiber optic. Photos of microdischarges were taken using a microscope and a digital camera. A self made fiber optic with 100 µm diameter was used in order to have an accurate measurement of a small part of the microplasma discharge. A negative pulse Marx Generator was used to energize the electrodes. Experiments were carried out at atmospheric pressure in Ar, N2/Ar and O2/Ar mixtures. Discharge voltage was negative pulse, rise time 100 ns, width 1 µs at 1 kHz. The electrodes used had 3 mm holes diameter and the discharge gap was set at 100 µm. Microplasma was measured in different points outside electrode and along X axis.

The spatial distribution of the light emission from streamers shown a wider area towards the negative electrode and a smaller and more intense area towards the grounded or the positive one. It was observed that the streamers diameter was about 10 µm. It was thinner than previously reported. The emission spectrum of the microplasma discharge in Ar and Ar/N2 mixture showed high intensity peaks of N2 second positive band system (N2 SPS 315.9 nm, 337.1 nm, 357.7 nm, 380.4 nm) and OH peaks (306 ~ 309 nm). The emission spectrum of the microplasma discharge in Ar in the ultraviolet region showed high intensity peaks of OH. An increase of OH intensity was observed starting from the outside the electrodes area while the intensity of Ar I decreased starting from the same point. This proves the presence of excited OH radical outside the discharge gap area and also excited Ar.