MICRODISCHARGE ARRAYS AS SOURCES OF INTENSE ULTRAVIOLET RADIATION

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In recent years, arrays of microdischarges operating at high pressure have attracted a lot of attention due to many applications, including plasma display panels, mercury-free light sources, and photodetector. In our studies, arrays of microdischarges are used for biological applications which require the development of new pulsed UV sources emitting in the DNA band absorption (UV-C: 200-280 nm). Such radiations can be obtained from exciplex molecules produced by non-equilibrium high pressure discharges. In this paper we report on the KrCl* emission at 222 nm.

Our devices basically consist of metal/dielectric/metal sandwiches drilled with several hundred microholes with individual diameters of some hundred microns. The geometry is similar to the Microhollow Cathode Discharges (MHCD) or the Cathode Boundary Layers Discharges (CBL) described by Schoenbach et co-workers [1,2]. However we used nanosecond pulsed excitation at high repetition frequency rather than applying DC voltages [3].

The study of the spatio-temporal behavior of the optical emission of these arrays has shown that, thanks to the nanosecond high voltage pulses, simultaneous ignition of all the microcavities are achieved without any ballast resistor allowing high values of the emitted optical peak power. The emission at 222 nm has been studied, through spectroscopic and optical power measurements, versus experimental parameters, such as the partial and total pressures, the electrical energy deposited per pulse, the repetition rate frequency and the voltage polarity. The results show that this excitation scheme is highly promising for the realisation of UV-C panels of large dimensions.


* Work supported by OSEO-ISI under contract IO081001W