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High Efficiency Singlet Oxygen Generator (SOG) Based on RF Discharge OLGA PROSHINA, OLEG BRAGINSKY, ALEXANDER KOVALEV, DMITRY LOPAEV, YURY MANKELEVICH, TATYANA RAKHIMOVA, ANNA VASILIEVA, Institute of Nuclear Physics, Moscow State University, Russia — One of the main problems in a laser power increasing is the pressure scaling of SOG. It was shown in our previous studies that the SO concentration in RF discharge plasma saturates with the increase of both pressure and specific energy deposition. The new three-body mechanism of fast SO quenching by oxygen atoms has been revealed. The HgO coating of a discharge tube wall allowed us to reduce atom oxygen density in the discharge region and so to depress the role of the three-body quenching. In the present report the experimental and theoretical study of the power supply frequency and NO admixture influence on the discharge structure and the SO yield was carried out in RF discharge with HgO coating. The increase of the power frequency from 13.56 to 80 and 160 MHz allows to get the uniform spatial discharge structure at an oxygen pressures up to 30 Torr and the high singlet oxygen yields up to 15%. It was shown that the simultaneous using of the NO admixture, the HgO wall coating and the high power frequency gives the effective conditions for SO excitation. The record values both the SO yield (21% at p_{O2}=10 Torr; 17% at p_{O2}=20 Torr) with the high energy efficiency ($\sim$ 18%) were obtained at first. A 2D self-consistent model was used to study RF discharges in gas flow. Results of the simulation agree with the experimental data.

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