

Metal Vapor Lasers with Modified Kinetics Pumped by a Capacitively Coupled Discharge

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The paper presents the results of experimental study of CuBr+Ne+HBr – laser excited by a capacitively coupled discharge. It is shown that capacitive discharge can be successively applied for pumping of lasers on self-terminated transitions in metal vapors including metal vapor lasers with modified kinetics.

At present time the main attention in investigation and development of metal vapor laser and metal halides vapor lasers is focused on lasers which active medium is doped with a small quantity of active additives. Such additives as H₂, HCl, HBr and other are admixed to the buffer gas to modify the kinetics of the laser active medium. It's so called lasers with modified kinetics [1, 2]. The doping leads to increasing in more than two times the power and frequency characteristics and also substantial improving the beam quality. Unfortunately the mentioned additives are aggressive to the materials of the electrodes and results to decreasing of life time of the laser active elements. A glow discharge typically used for pumping of metal vapor lasers is implied the direct contact of electrodes with the gas medium. Versus this type of excitation, in case of capacitively coupled discharge the electrodes are placed on the external wall of a gas discharge tube and are separated from gas medium. Electric coupling of plasma inside the gas discharge tube and external electrodes in this case has capacitive type. The possibility of application of longitudinal capacitive discharge for pumping of lasers on self-terminated transitions in metal vapors has been demonstrated for the first time in paper [3]. In this work a simple design of CuBr-laser with external electrodes were suggested.

The aim of the work was studying of HBr effect on the operation characteristics of CuBr-laser. Investigation of possibility of capacitive discharge application for pumping of other metal halides lasers was also in the focus of the research.

Comparison of excitation by longitudinal capacitive discharge with traditional for metal vapor lasers type of excitation was carried out in the work. The practically significant values of average lasing power and efficiency at 510.6 и 578.2 nm wavelengths were obtained in CuBr+Ne+HBr-laser. The perspectives of capacitive discharge application for pumping of lasers on self-terminated transitions in metal vapors, including modes with high pulse repetition frequencies (more than 100 kHz), are discussed.

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