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Small signal gain coefficient in Ar X-ray lasers using geometrically dependent gain coefficient

Akbar Hariri
Nuclear Science and Technology Research Institute, Iran

The model of the geometrically dependent gain coefficient (GDGC) along with the reported amplified spontaneous emission (ASE) experimental measurements for the intensity and line-width in Ar X-ray lasers at 46.9 nm are used to calculated the behavior of the gain coefficient and line-width with respect to capillary discharge length. It is shown that by deducing gain parameters from measurements of the ASE intensity vs. excitation length, the unsaturated and saturated gain coefficients for a given excitation length can be obtained. According to our calculation a general plot of gain coefficient with respect to excitation length, corresponding to 13 different experimental measurements, reported from different laboratories is introduced, where the plot confirms the validity of the GDGC model to be applied for Ar X-ray lasers and also for unifying these lasers. For a typical recent experimental observation for i=21 kA and Ar gas pressure of 440 mTorr the intrinsic Voigt profile line-width is calculated to be 55.67 mÅ which is very close to Doppler line-width of 53.52 mÅ. In addition, a summery of the past experimental observations and measurements for this laser is introduced. Details for the analytical and numerical calculations for the gain coefficient and line-width versus excitation length will be also given.

akbar_hariri@yahoo.com

Activated huntite-like glasses are promising photonic materials

Georgii Malashkevich
D Mendeleyev University of Chemical Technology, Russia

Glasses of the $(Ln_xY_{1-x})_2O_3$-Al_2O_3-B_2O_3 system with composition close to the huntite stoichiometry (huntite-like glasses) are characterized by the highest value (about 0.67 nm) of minimal distance between the rare earth ions for oxide matrixes and relatively high thermal and physicochemical characteristics. That gives to such glasses the attractive perspectives for use as different light converters and optical sensors as well as high-doped laser materials. In this report, we consider structural, spectral-luminescent, thermal and laser properties of the glasses activated with Ce^{3+}, Sm^{3+}, Gd^{3+}, Tb^{3+}, Yb^{3+}, and Sb^{3+} ions depending on their synthesis conditions. It have been established that the glasses investigated permits to control the $[BO_3]/[BO_4]$ groups relation by temperature of synthesis. A peak value of their quantum yield of luminescence, limited by intracenter exchange of excitations in vibration of structural elements of the matrix, for the Yb^{3+} ions was about 90% and close to 100% for the other ones. It is shown a high competitiveness of the Ce-Gd-Tb-Sb-containing glasses for solving of problem connected with visualization of UV images and X-rays and discussed lasing on the Yb-containing glasses obtained for the first time. It is noted a low efficiency of cooperative luminescence of Yb^{3+} ions and relatively effective Raman scattering in the glasses.

g.malashkevich@ifanbel.bas-net.by