HIGH-POWER CO LASER WITH RF DISCHARGE FOR OPTICAL STOCHASTIC COOLING AND ISOTOPE SEPARATION OF URANIUM

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A CO laser radiation at wavelength 5,3 μm was proposed to be applied for optical stochastic cooling and for isotope separation of uranium. Obtaining of nanosecond pulses at wavelength 5,3 μm in single line mode is described in papers[1, 2]. In the facility[2] there is cryogenic refrigerator with diffusion cooling of active medium and electron gun for ionization of active medium.

The CO laser generation was received on the small-scale installation with RF discharge in supersonic stream[3]. There is not an electron gun and cryogenic refrigerator. The technical decision of high-power CO laser with electric discharge in a supersonic stream was proposed[4]. The RF discharge excites a supersonic gas flow cooled to cryogenic temperatures by expanding in the nozzle.

The calculation optimization of nanosecond pulses of CO laser with RF discharge in supersonic stream at wavelength 5,3 μm was carried out for isotope separation. This separation employs condensation suppression of dimmer formation in a supercooled jet. The demanded parameters of laser and parameters of separating block for industrial production the nuclear fuel were defined. The engineering solution for CO laser with serial elements was proposed.

The estimated low cost of proposed laser comes out from the absence in the closed working cycle: a body of closed contour, a special pumping system, cryogenic refrigerators, sectionalized electrodes, active ballast resistance, an electron gun, a fiber optic delivery.

The proposed laser has the small size of laser head (nozzle, discharge chamber, resonator, diffuser). However the average laser power is high because of the very high speed of mass flow. The high pressure before the nozzle and the atmospheric pressure after the diffuser allows to use pipelines to connect to the serial compressor. Therefore the laser head can be installed close to working zone.

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