

An insight into the recent research in carbon monoxide lasers

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Carbon monoxide laser is quite promising object for the development of high-power source of coherent radiation in the mid-IR. The CO laser can operate on more than 1000 spectral lines within both fundamental vibrational band (4.7-8.2 microns) and first-overtone band (2.5-4.2 microns). Spectral range of first-overtone CO laser covers the atmospheric transparency window (~3.3-4.0 microns). Thus the laser can be applied for transportation of high-power laser in the atmosphere. In our Gas Lasers Lab at the LPI we developed pulsed high-power CO laser which can operate in both bands. This laser in mode-locked regime emitted train of nanosecond laser pulses in multiline or single line modes. Since the great number of CO laser spectral lines is in spectral region where absorption lines of many explosive and toxic substances lie, a CO laser can be used for multi component gas analysis. For such applications we developed slab CO laser excited by radio-frequency discharge. We also applied low pressure CO laser operating in Q switched mode for frequency conversion in nonlinear optical crystal. We obtained second harmonic and sum frequency generation (as first stage). Moreover, we obtained two-stage frequency conversion due to difference frequency generation in second stage. Thus, on the basis of a single nonlinear crystal pumped by one CO laser (5.0-7.5 microns), we developed broadband laser source with spectral range (2.5-8.3 microns) more than one-and-half octave.

Biography

A.A. Kotkov received his M.S. degree from Moscow Institute of Physics and Technology (MIPT) in 1982 and Ph.D. degree from the Lebedev Physics Institute (LPI) in 2000. His Ph.D. dissertation is devoted to experimental research on non-linear optical properties of laser media of high power CO₂ and CO lasers. The study was carried out by the intracavity phase conjugation under degenerate four-wave mixing in both laser media itself. He has five patents and over 50 scientific publications in reputed journals. He has got the academic rank of Associated Professor on the laser physics from the Russian Academy of Sciences in 2004. He was awarded by N.G. Basov prize in 2006.

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