

Frontiers in mid-infrared lasers based on transition metal doped II-VI semiconductors

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Recent progress in fabrication of high-quality thermo-diffusion doped polycrystalline and hot-pressed ceramic Cr²⁺-doped ZnSe and ZnS gain media as well as nano and micro-crystalline laser active powders, powders in the liquid suspension, and polymer-film are reported. Demonstration of mid-IR lasing in Cr:ZnSe waveguide structures and the first laser oscillation of the Cr:ZnSe/As₂S₃:As₂Se₃ composite materials will be described. These composite materials are very promising for mid-IR fiber-laser applications.

Progress in the technology of fabrication of high-quality uniformly doped TM:ZnSe/S gain elements in combination with proper thermal management and cavities design enabled demonstration of high power; high energy; tunable (1.9-3.3 μm), mid-IR Cr:ZnS/Se lasers operating in CW (>20 W), gain-switched (>20 mJ@7 ns) and long pulse (>1 J@7 ms) regimes.

We will also report on recent progress in development of new gain media for tunable (3-8 μm) mid-IR lasers as well as Fe:ZnS/Se lasers operating in CW (>1.5 W), gain-switched (>1 mJ@7 ns@1 kHz) and long-pulse (>0.5 J@200 μs) regimes.

In addition to effective RT mid-IR lasing transition metal (TM) doped II-VI media, being wide band semiconductors, hold potential for direct electrical excitation. Possible promising routes for achieving mid-IR lasing under electrical excitation will be discussed.

Biography

Sergey Mirov received Ph.D. in Physics in 1983, from the P. N. Lebedev Physics Institute of the USSR Academy of Sciences. Since 1993, Mirov is a faculty at the University of Alabama at Birmingham. Currently, he is a university Professor of Physics at the UAB and director of the Center for Optical Sensors and Spectroscopies. He is a fellow of the Optical Society of America, and member of the American Physics Society, and SPIE. He has authored or co-authored over three hundred ninety scientific publications, has published 1 book, several book chapters, and holds twenty patents.

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