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

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Abstract

Recent progress in fabrication of high-quality thermo-diffusion doped polycrystalline and hot-pressed ceramic Cr^{2+}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/As_2S_3:As_2Se_3 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 um), mid-IR Cr:ZnS/Se lasers operating in CW(>20 W), gain-switched (>20 mJ@7ns) and long pulse(>1 J@7ms) 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 (>1.5W), gain-switched (>1 mJ@7ns@1kHz) 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 PhD in physics in 1983, from the P. N Lebedev Physics Institute of the USSR Academy of Sciences. Since 1993, Dr. 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. Dr. Mirov 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.