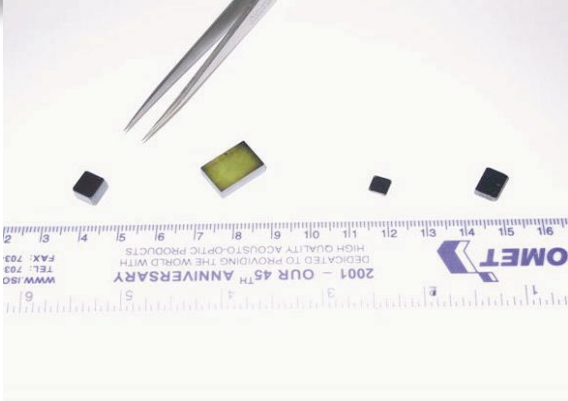
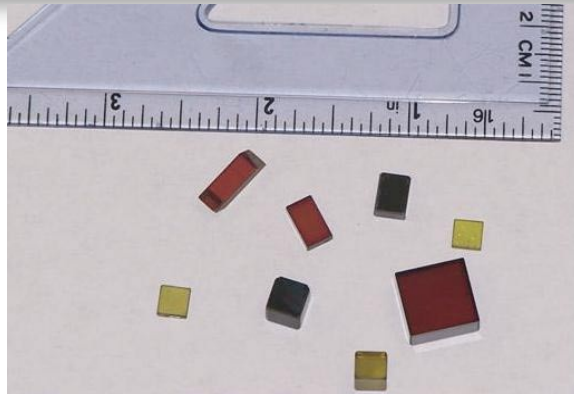


Cr²⁺:ZnS and Cr²⁺:ZnSe CW microchip lasers

pumped by 1.5-1.9 μm Semiconductor, or Er- or Tm-fiber lasers

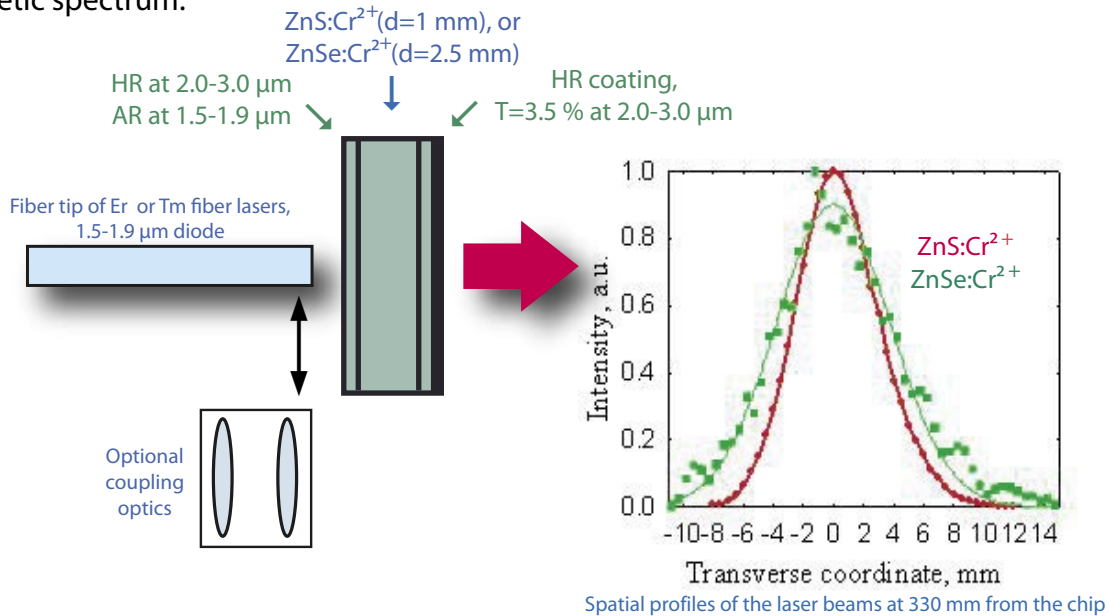


Samples of the Cr²⁺:ZnS and Cr²⁺:ZnSe microchip lasers and crystals



Schematic diagram of the microchip laser pumped by a fiber laser

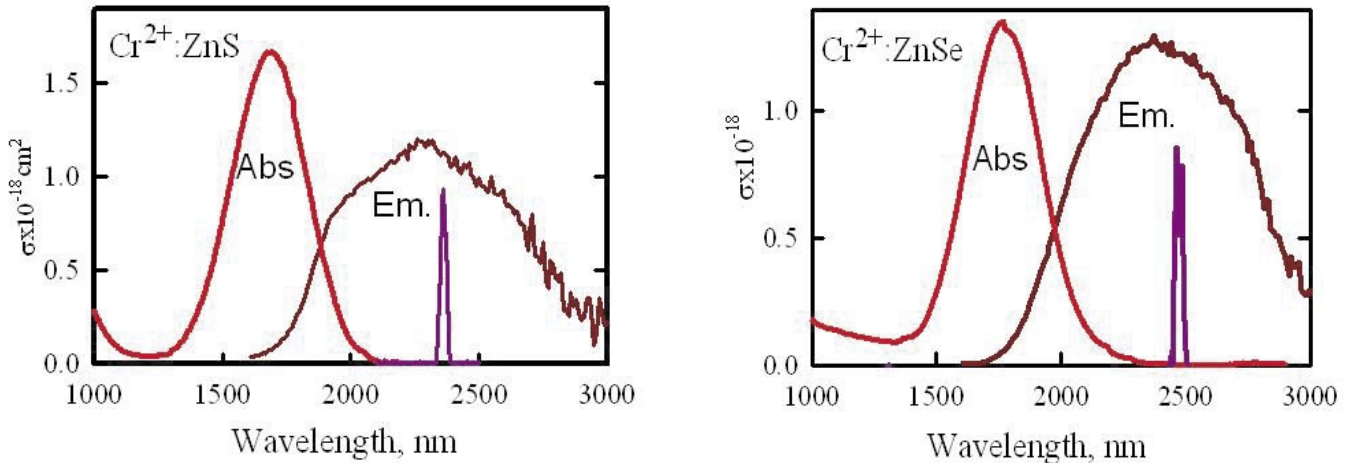
- To meet the need for a low-cost, reliable mid-IR lasers fiber and diode pumpable microchip lasers based on chromium doped ZnS and ZnSe semiconductor material were successfully demonstrated.
- The lasers operate at room temperature with high, close to theoretical limit, efficiency (up to 80%) and narrow linewidth (up to single frequency operation).
- The output wavelength of the microchip could be adjustable over 2-3 micron region of electromagnetic spectrum.



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Cross-sections of absorption and emission, superimposed with the lasing spectra.

The technology of low-cost optically, and possibly electrically pumped, broadly tunable mid-IR laser sources will certainly impact medical, environmental, scientific, and counter-terrorism applications such as: surgical scalpel that make use of the ability of the laser to tune in and out of the strong absorption band of liquid water, non-invasive optical blood glucose monitoring around 2.3 μm through the human skin, measurement of medically important molecular compounds in the exhaled breath of patients, industrial process control, as well as detection of explosives, chemical and biological warfare agents. It may also address critical military needs such as IR countermeasures and free-space communications.

Commercial

- Species-specific gas monitoring in production facilities;
- Surgical applications that make use of the ability of the laser to tune in and out of the strong absorption band of liquid water;
- Ideal source for pumping optical parametric oscillators;
- Ideal source for cavity ring-down spectroscopy;

Military

- Aircraft and ship-based countermeasures;
- Remote sensing for chemical warfare detection;
- Counterproliferation intelligence gathering;
- Eyesafe seekers for smart munitions and cruise missiles;
- Free-space communications;

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