

Broadly tuneable Cr²⁺:ZnSe channel waveguide laser

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Laser sources in the mid-infrared region are of great interest for a number of scientific and commercial applications because of the atmospheric transmissions window (2-5 μ m), which contains many fundamental and vibronic absorption lines. Transition metal doped II-VI semiconductors possess many desirable laser medium qualities such as large emission bandwidths, no excited state absorption and room temperature operation[1-3]. Of these materials Cr²⁺:ZnSe has come to the fore with tens of watts output power and tunable laser operation from 1973-3349 nm [4, 5]. Cr²⁺ waveguide laser sources provide a compact and robust, vibration insensitive geometry well suited to applications outside of the laboratory. Such sources would allow room temperature laser operation in the 2-3 μ m wavelength range where the availability of quantum cascade lasers is strongly limited [6].

A external cavity Cr²⁺:ZnSe channel waveguide laser is demonstrated. The channel waveguides were fabricated by ultrafast laser description as described in detail in Macdonald *et al.* [7]. Wavelength selectivity was achieved by an external cavity with a Brewster cut Si prism and a rotation mounted output coupler. The laser demonstrated a tunable range of 2080 to 2883 nm, the widest demonstrated by a waveguide laser to the best of the authors' knowledge. A maximum output power of 110 mW at 2615 nm with a FWHM of 1.2 nm was measured. More than 15 mW of output power was produced over the whole wavelength range with a pump power of 1.4 W at 1.9 μ m.

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