

A Pr³⁺-DOPED SINGLE-MODE FIBRE LASER

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ABSTRACT

The rare-earth doped single-mode fibre laser has emerged as a new source of laser radiation in the near infrared region of the spectrum. Using an Ar⁺-ion, dye or semiconductor laser as a pump source, low threshold CW or pulsed operation is possible over a wide range of wavelengths. Low threshold CW laser emission is also possible on 3-level transitions at room temperature with no auxiliary cooling requirements.

As an example, laser operation has been obtained at 1085nm on the $^1G_4 - ^3H_4$ (groundstate) transition of Pr³⁺-ions in glass. The excitation source was a CW Rh6G dye laser operating at 590nm, although such was the absorption of the Pr³⁺-doped fibre that most of the Rh6G emission spectrum could be used for pumping. Using a cleaved fibre butted to two dielectric mirrors having high reflectivity at the lasing wavelength, CW threshold was found to occur for 10mW of absorbed power at 590nm.

Q-switching has been obtained using an intracavity acousto-optic modulator. In preliminary experiments using a non-optimised cavity, we have obtained pulses of 500ns duration and >1W peak power at a repetition rate of several kHz. Using a more efficient configuration, over an order of magnitude increase in peak power is anticipated.

By replacing the output mirror with a diffraction grating blazed at λ_{lum} , a 61nm tuning range from 1048nm - 1109nm has been obtained.

Using an alternative pump source, visible operation of this laser may be possible.