Recent progress in the design of passive and active fibres for use in high power fibre lasers and amplifiers at visible and near-IR wavelengths

Adrian Carter

Nufern, 7 Airport Park Road, East Granby, CT 06026, USA
Phone: +1-860-408-5000, Fax: +1-860-408-5080
Email: acarter@nufern.com

ABSTRACT

Solid state and gas lasers are routinely capable of producing cw multi-kW output powers and as such have become the mainstay of the laser cutting and welding industry. However despite numerous advancements in their design these lasers are still typified by poor wallplug efficiencies and/or relatively poor optical beam qualities, making them unsuitable for most weapons applications. On the other hand recent developments in laser diode technology, fibre design and beam combining techniques have meant that cladding pumped ytterbium-doped fibre lasers have attracted growing interest as a route to highly efficient, high output power, high beam quality (near-diffraction limited) lasers. For certain applications, such as ranging and free-space communications, operating in the "eye-safe" 1.5-2.0micron range is preferred. For such "wavelength specific" applications it becomes necessary to employ a variety of optically-active lanthanide ions, such as thulium or codoped erbium/ytterbium. By employing nonlinear frequency conversion on the polarized and spectrally narrow outputs of such fibre lasers it is possible to generate lasing output in the visible and ultraviolet. In this paper we review the recent progress in fibre design that is facilitating the scalability of the output power of fibre-based lasers and amplifiers.