

Pulsed laser deposition (PLD) growth of high quality low-loss optical waveguide films of ternary and quaternary doped garnets.

PLD has been used for more than 20 years in the area of thin film material growth, and while it is routinely easy to deposit a layer of material onto a given substrate, deposition of high quality material, particularly in the context of the growth of optical waveguiding films is another matter altogether. For successful and efficient lasing to occur, optical losses, as measured *in the plane* of the thin film, must not exceed the level of a few dB cm^{-1} , and the structure grown must be capable of being laser-diode pumped.

In this talk, I shall describe our progress towards successful growth of such high quality waveguides, where current losses are less than 0.1dB cm^{-1} . The talk will cover the principles and advantages of multi-target geometries, our use of CO_2 laser heating, the growth of multilayers, cladding pumped geometries, numerical aperture engineering, mixed garnet growth, and how we cope with the ever-present problem of particulates, which can in principle add considerably to passive loss. I will also describe our current PLD programme to design and fabricate sophisticated 3D structures, involving Gaussian doping and spatially structured gain profiles.