

Preparation and Characterization of crystals Nd:YLF for use as active medium in solid state laser

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Solid-state lasers have been prominent on the lasers market, particularly crystals doped with rare earths ions. Given this interest, these materials have been improved over the last years and its production costs optimized. The numerous possibilities and applications of high power lasers in diverse areas such as medicine, industry, scientific research, mapping and positioning, laser processing and characterization of materials and telecommunications has stimulated further research in this area.

The Centro de Lasers e Aplicações (CLA) of IPEN has been producing mono-crystalline fibers and bulk crystals doped with rare earth elements of optical quality sufficiently high to be incorporated as active media in solid-state lasers. The crystals are grown by the crystal growth research team and are then passed on to the laser development team characterization and preparation of the laser crystals.

In this work we highlight the process of preparing the crystal and the methodology adopted to process step by step the crystals during cutting and polishing. In particular, polishing is a fundamental step for the successful use of the material as an active medium. The procedure for the preparation of this material is very laborious and slow. Here we present a method that optimizes the time and facilitates the preparation of the material and also results in greater accuracy in terms of flatness of the polished surface. This was possible with the acquisition of a new machine for the polishing of one-dimensional crystals which, after some constructive changes that will be outlined in this work, could also perform polishing of volumetric crystals. We obtained a flatness exceeding $\lambda/10$ in the central portion of the crystal and $3\lambda/2$ in the remaining surface area. This surface finish is adequate for longitudinal pumping with semiconductor lasers.