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Mitigation of Thermal Effects in End Pumping of Nd:YAG and Composite YAG/Nd:YAG Laser Crystals, Modelling and Experiments¹

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In this work, we have presented a finite element (FE) numerical modelling simulations to study and analyze the thermal effects in Nd:YAG and composite YAG/Nd:YAG laser rods. We have calculated the temperature distributions, stress intensity and thermal focal lengths at different pump powers for both rods. The FE simulations showed that using composite laser rod of undoped cap reduces the maximum value of stress intensity and thermal focal length by $\sim 35\%$ and $\sim 50\%$, respectively. We have verified the FE calculations experimentally by direct measurement of focal length of thermally induced lens by using Hartmann–Shack wavefront sensor. Good agreement was obtained between FE calculations and experimental measurements.

Keywords: Nd:YAG lasers, Thermal lens, Wavefront sensing, solid state lasers.

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