STRONG PHOTOREFRACTIVE RESPONSE OF Rh:DOPED $BaTiO_3$ AT RED AND INFRARED WAVELENGTHS

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$BaTiO_3$ crystal is one of the most efficient photorefractive materials, showing strong beam coupling and phase conjugation effects. Its attractive properties are, however, normally limited to visible wavelengths. In order to improve its infrared response, a new type of $BaTiO_3$ has been grown [1] with additional impurities, mainly rhodium.

We have investigated this new Rh:$BaTiO_3$ to characterise its response and optical parameters. Our first results show an enhanced absorption at red and infrared wavelengths [2] and high reflectivities in self-pumped phase conjugate configurations. Additionally, strong laser-induced effects have been observed [3].

The aim of the studies presented in this contribution was to provide information about photorefractive centres present in Rh:$BaTiO_3$. Using dual-wavelength illumination we were able to investigate more thoroughly the laser-induced change in absorption. Laser-induced absorption and transparency was measured at both visible (514.5, 633 and 750 nm) and infrared (800 and 1060 nm) wavelengths. Further, we have successfully modelled the observed changes, using numerical simulation of photorefractive centres, and achieved a good agreement between theory and experiment.

The strong changes of absorption influence the beam-coupling processes and phase conjugation. We will present the results of extremely high two-beam coupling gain, namely bigger than 20 000, obtained in only a 3 mm thick crystal. We believe that this is the highest photorefractive gain ever reported. We will discuss this experimental data together with theoretical modelling.

REFERENCES

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