

2.5 Time-Resolved Photoexcitation Studies in Photorefractive KNbO₃ at Visible and Ultraviolet Wavelengths

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The nanosecond photorefractive response due to pulsed uv illumination measured last year was evaluated and interpreted as a combination of absorption, free charge and photogalvanic gratings.

An experimental setup that allows the photorefractive response to short visible pulses to be measured over a range of time scales at different sample temperatures was constructed and tested. Iron doped, hole conducting KNbO₃ shows photorefractive responses on different time scales ranging from microseconds to many minutes.

Two distinct build up regimes were observed: an initial response during first 50 μ s after excitation by a single pulse followed by a slower build up on the millisecond time scale. These responses depend upon charge transport properties such as the mobility, and the shallow and deep trap concentrations. The decay of the grating because of recombination takes as long as some minutes.

The measurements over a range of time scales are a powerful tool to characterize the charge transport properties of crystals containing different dopants and which were subjected to different treatments.