Thesis abstract

Thesis title: pulsed optical stimulation of luminescence from quartz
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A light emitting diode based pulsing system capable of producing luminescence time-resolved spectra was developed for study of optically stimulated luminescence from quartz and feldspar. The aim of the pulsed optical stimulation method is to separate in time stimulation and detection of luminescence so that luminescence can be measured in the absence of scatter from stimulating light unlike in conventional continuous stimulation where luminescence monitored includes such scatter. Pulsed optical stimulation not only offers the possibility of improvements in signal to background ratio but also the ability to investigate the time dependence of luminescence emission relative to the time of stimulation. Although study of pulsed luminescence has been dominated by laser-based systems, a pulsing system based on light emitting diodes offers, in comparison, advantages of simplicity and economy.

The present system has been used over a wide range of pulse widths (25 ns (FWHM) - 30 μs) and dynamics ranges (40 ns - 64 μs). The system can be adapted for use with a wide range of wavelengths with pulse widths from 25 ns (FWHM) to as long as desired.

Luminescence time-resolved spectra have been recorded from feldspar and quartz. Half lives measured from feldspar range from 25 ns and from quartz, 20 - 28 μs. Properties of luminescence half lives from quartz were studied in detail as a function of experimental parameters such as stimulation time, temperature, radiation dose, and preheating method. The influence of temperature on luminescence intensity was studied for time-resolved spectra recorded at long stimulation times. Explanations rare proposed to account for experimental results.