



**University of Adelaide**  
**Department of Physics and Mathematical Physics**

A Thesis  
presented for the Degree of  
Master of Science

**Luminescence of Quartz**

**Roger Scholefield B.Sc.(Hons)**

December 1994

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## Summary

The research carried out in this study concerns the physics involved in the process of thermoluminescence in quartz. Most of the experiments conducted during the study involved measuring thermoluminescence spectra emitted from quartz samples.

The first chapter gives a brief introduction into the physics of thermoluminescence, and how it can be used in obtaining dates in archaeological and geological contexts.

Chapters two and three detail the ideas of Fourier Transform Spectroscopy and the spectrometer, which was used to measure the spectra. Since spectra show the wavelength of the photon, the temperature of the emission, and its intensity, this lends itself to a 3-D presentation, either as a contour, or an isometric plot.

Chapter four gives a review of work done by other workers, in order to see what conclusions can be drawn from their work.

Chapter five details the work done by this author in obtaining spectral data from over thirty different samples. Particular interest was given to the quartz glow curve peaks that are used in dating procedures, namely the 110, 325 and 375°C peaks. These peaks were found to have emission wavelengths of 380, 440, and 480 nm respectively. The easy bleaching property of the 325°C peaks was used to investigate it, although it was found that this peak was of varying strength in different samples, and sometimes did not appear at all. Following reports from overseas of emissions at 630 nm in quartz, and the use of that wavelength for dating of deposits, a survey of Australian quartz samples for emissions at this wavelength was undertaken. The results are discussed, along with conclusions about what is actually happening in the quartz crystal during the process of thermoluminescence.

The final chapter gives a few ideas for future work, in order to further improve the understanding of thermoluminescence in quartz.

# Statement

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university, and to the best of the author's knowledge and belief, contains no material previously published or written by another person, except where due reference is made in the text.

The author consents to the thesis being available for photocopying and loan.

Roger Scholefield  
University of Adelaide  
December 1994

## Acknowledgements

I would like to thank my supervisor Professor J.R.Prescott, whose guidance and suggestions proved invaluable throughout this study. The other members of the Archaeometry research group, Dr G.B.Robertson and the late J.T.Hutton also provided assistance which was gratefully accepted. Fruitful discussions were also so held with visiting researchers, Dr G.A.T.Duller and Professor A.D.Franklin, who also deputised as supervisor in the absence of J.R.Prescott. Special thanks go to Phil Fox for showing me the intricacies of the spectrometer and how to use it.

Neville Wild is thanked for solving problems associated with electronics in the equipment, despite his own heavy workload.

Finally I am grateful for the support shown to me throughout this study by my parents, and especially Jutta.