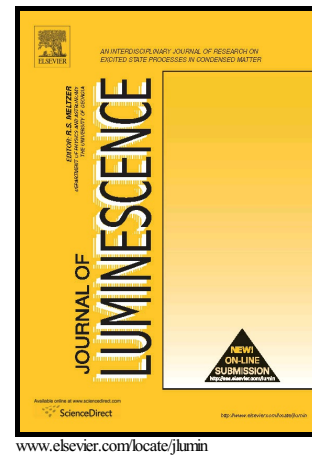


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A study of the kinetics of a high temperature thermoluminescence peak in
annealed natural quartz

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ABSTRACT

Thermoluminescence of a high temperature secondary glow-peak in natural quartz annealed at 900 °C is reported. The glow-curve of a sample irradiated to 10 Gy and measured at 1 °C/s shows three peaks; the main peak at 71 °C and two other weaker-intensity peaks at 125 °C and 177 °C. For reference, the peaks are labelled as I, II and III. This study is concerned with the secondary peak at 177 °C (peak III). The electron trap responsible for peak III is stable at ambient temperature as determined by monitoring the peak intensity after various delays between irradiation and measurement. The activation energy and frequency factor of the peak were estimated as ~1.24 eV and $\sim 10^{12} \text{ s}^{-1}$ respectively. The dose response of the peak in the range 1 to 300 Gy is sublinear. The influence of either partial heating or irradiation dose on the peak position suggest that the peak follows non-first-order kinetics.

Keywords: thermoluminescence; quartz; glow curve; dose response; kinetic analysis

1. Introduction

Quartz, the subject of this study, is formed from the mineral silicon dioxide and is naturally abundant [1]. The luminescence properties of both natural and synthetic quartz

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