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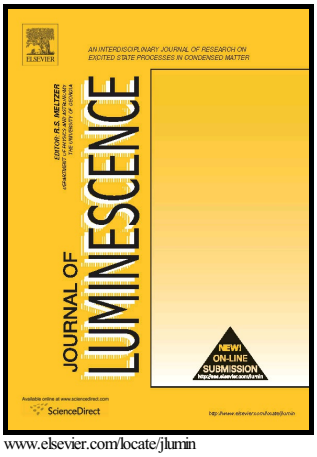

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Optical bleaching of the 375 °C TL peak, $[GeO_4/Li^+]^0$ EPR center and OSL signal in irradiated natural quartz

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Abstract

The effect of exposure of quartz samples to blue (470 ± 30 nm) and UV (365 ± 10 nm) light has been studied. Thermoluminescence, TL, Electron Paramagnetic Resonance, EPR, and Optically Stimulated Luminescence, OSL, have been considered.

Looking at the OSL signal, while a reduction of the slow component is indeed induced by the UV exposure, a similar effect is observed, although with lower efficiency, under blue light exposure. Therefore, no conclusions can then be drawn as regards the effects induced on the OSL signal upon a change in the excitation wavelength.

The effect of the UV and blue light exposure on the so called Slowly Bleachable Peak, SBP [1], observed by TL at 340 °C, heating rate 5 °C/s, is presented. It is noticed a decrease of the SBP induced by UV exposure while no effect is caused by blue light exposure. A similar behaviour is detected when looking at the EPR signal of the $[GeO_4/Li^+]^0$ centre, that is reduced by the UV light, while no effect is seen after exposure to blue light.

These results suggest that one of the electron sources originating the SBP can be identified as the $[GeO_4/Li^+]^0$ center.

Keywords

Thermoluminescence, Electron Paramagnetic Resonance, Optical Stimulated Luminescence, Point Defects, Quartz

1. Introduction

The identification of the defects responsible for trapping and luminescence emissions in quartz is not straightforward. In fact, the studies of TL and OSL give only a phenomenological picture, while the possibility of comparing the EPR features as a function of irradiation and thermal treatments with the luminescence properties can allow to determine which are the centres responsible for them. As regards the trapping centres, germanium, practically always present in quartz, is known to give origin to a number of centres that play a role in electron trapping: the diamagnetic $[GeO_4]^0$ centre, given by a Ge substituting for a Si, the paramagnetic