Optical determination of the width of the band-tail states, and the excited state and ground state energies of the principal dosimetric trap in feldspar

We constrain parameters that determine thermal stability of the infrared stimulated luminescence (IRSL) signal in a suite of 13 compositionally different feldspar samples by optical probing. We focus specifically on the excited and ground state of the principal trap and the width of the sub-conduction band-tail states. Excitation spectra measured at room temperature result in approximate trap depth of about 2.04 eV and the excited state energy at 1.44 ± 0.02 eV, irrespective of feldspar composition for the sample's measured here. Fitting the non-resonant rising continuum of the excitation spectra suggests that the width of the band-tail states accessible from the ground state of the trap (ΔE) ranges from 0.21 to 0.47 eV at room temperature between the different samples. Photoluminescence measurements are used to constrain the full sub-conduction band-tail width (Urbach width, Eu) using the excitation-energy-dependent emission (EDE), resulting in values ranging from 0.26 to 0.81 eV. While the depth of the principal trap and its main excited state seem to be independent of feldspar composition, the difference between ΔE and Eu seems to be related to sample K-content.

General information
Publication status: Published
Organisations: Center for Nuclear Technologies, Radiation Physics, Aberystwyth University, University of Bern, University of St Andrews
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Pages: 40-51
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Radiation Measurements
Volume: 125
ISSN (Print): 1350-4487
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
Original language: English
Keywords: Trap depth, IR Resonance, Band-tail states, Excitation spectrum, Emission spectrum, Excitation-energy-dependent emission
DOIs: 10.1016/j.radmeas.2018.08.019
Source: FindIt
Source-ID: 2438830123
Research output: Contribution to journal → Journal article – Annual report year: 2019 → Research → peer-review