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The Thermoluminescence and Cathodoluminescence Properties of Feldspar: A Preliminary Assessment for the Dating of Recent (< 1 My) Volcanic and Igneous Rocks

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Thermoluminescence (TL) techniques are currently used for archaeological dating and dating of loess deposits up to 800,000 years old; these applications are based on the TL of quartz. The TL of feldspar has been examined in the past as a possible chronometer for volcanic and igneous rocks but was dismissed after preliminary work seemed to indicate that feldspars exhibit "anomalous fading", i.e., loss of TL intensity which is not related to temperature, possibly due to electron tunnelling. We here present our data for a suite of terrestrial and meteoritic feldspars which indicate that it should be possible to use the TL of feldspar for the dating of recent volcanic and igneous rocks.

We find that absolute induced TL intensity is a function of feldspar composition, with albitic feldspar being higher in intensity than anorthite. Based on cathodoluminescence (CL) images, however, the observed TL trend is caused by a change in wavelength of luminescence emission rather than an change in total induced luminescence intensity. Fading experiments on terrestrial feldspars covering a range of compositions show that only one sample, an andesine, exhibits "anomalous fading". These data indicate that it should be possible to date the buildup of TL in terrestrial feldspars and, in those cases where anomalous fading is present, correction factors can be applied for dating purposes.