Geophysical Research Abstracts
Vol. 14, EGU2012-10266, 2012
EGU General Assembly 2012

A comparison of the OSL response of quartz and polymineral fine grains to alpha and beta radiation

S. E. Lowick
University of Bern, Institute of Geological Sciences, 3012 Bern, Switzerland (lowick@geo.unibe.ch)

Optically stimulated luminescence (OSL) dating utilises a signal in quartz and feldspar grains that originates through the excitation of free electrons as environmental radionuclides decay, and emit alpha, beta and gamma ionising radiation. The rate at which the charge accumulates can be measured by determining the amount of radionuclides surrounding, and within, the sample. The OSL signal that is accumulated during burial is then determined by measuring the sample's response to a laboratory generated radiation dose by a beta source. This makes the age calculation relatively simple with regard to contributions from beta and gamma radiation, as both create a similar luminescence response. However, the lower penetrating power of alpha radiation, as well as a dramatically reduced efficiency in generating a signal requires further modification to the age calculation. This is easily overcome in the case of coarse grains, where the outer part of the grain affected by alpha radiation can be removed, and with it any need to consider an alpha contribution to the dose. Fine grains however, i.e. 4 – 11 μm, retain the full alpha dose and so the sensitivity of a sample to alpha radiation is required for the age calculation. The alpha and beta generated dose response curves are reported to differ at high doses (Zimmerman, 1972; Mauz et al., 2006), and this may impact on older samples that approach the limit of the dating range. For this reason, the dose response to both alpha and beta radiation has been investigated in fine grain samples where burial doses fall on the later part of the dose response curve. Results for OSL in quartz, and infrared stimulated luminescence (IRSL) and post-IR IRSL in polymineral grains will be reported.

Mauz, B., Packman, S., Lang, A., 2006. The alpha effectiveness in silt-sized quartz: new data obtained by single and multiple aliquot protocols. Ancient TL 24(2), 47-52.
Zimmerman, D. W., 1972. Relative thermoluminescent effects of alpha- and beta-radiation. Radiation Effects 14, 81-92.