A new irradiated quartz for beta source calibration

For luminescence dating to be an accurate absolute dating technique it is very important that we are able to deliver absolutely known radiation doses in the laboratory. This is normally done using a radiation source (alpha, beta, X-ray) calibrated against an absolutely known reference source. Many laboratories have used the various different batches of Risø calibration quartz for the calibration of beta and X-ray sources, but these have been largely undescribed. Here we describe in detail the preparation and luminescence characteristics of a new quartz standard, based on a North Sea beach sand collected from south-western Denmark (Rømø). Two grain sizes (4-11μm and 180-250μm) have been examined in detail. These were pre-treated (annealed, dosed and annealed again) to sensitise and stabilise the luminescence signals before being given an absolutely known gamma dose from a point 137Cs source in scatter-free geometry. The luminescence characteristics are described; the very intense blue-light stimulated signal is dominated by the fast OSL component and the IR-stimulated signal is negligible. The material is shown to be suitable for measurement using SAR, and the dose recovery ratio is indistinguishable from unity with a standard deviation of 80% of the grains giving a useful signal. Although there is an unexplained dispersion in our calibration data of ~3% (which we cannot attribute to instrument variability), we nevertheless conclude that this material is very suitable for transferring absolute known doses from a standardised gamma source to in-built irradiation sources.

General information
Publication status: Published
Organisations: Center for Nuclear Technologies, Radiation Physics, Aarhus University
Contributors: Hansen, V., Murray, A. S., Buylaert, J., Yeo, E., Thomsen, K. J.
Pages: 123–127
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Radiation Measurements
Volume: 81
ISSN (Print): 1350-4487
Ratings:
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.26 SJR 0.639 SNIP 1.145
Web of Science (2015): Impact factor 1.071
Web of Science (2015): Indexed yes
Original language: English
Keywords: Beta source calibration, Coarse grain, Fine grain, OSL, Quartz, Single grain, Dispersions, Luminescence, Coarse grains, Fine grains, Irradiation sources, Luminescence characteristics, Luminescence dating, Luminescence signals, Single grains, Calibration

DOIs: 10.1016/j.radmeas.2015.02.017
Source: FindIt
Source-ID: 274239449
Research output: Contribution to journal › Conference article – Annual report year: 2015 › Research › peer-review