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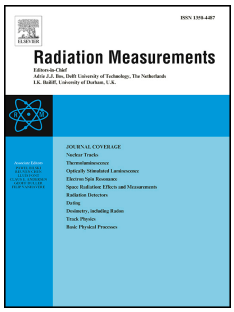

Background variation and radiation-induced darkening of radiophotoluminescent detectors

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Background variation and radiation-induced darkening of radiophotoluminescent detectors

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Abstract

Radiophotoluminescent (RPL) detectors are used extensively for measurement of γ, X and β radiations. While these detectors show excellent dosimetric properties, we point out behaviors observed in their routine use that can affect the accuracy of their results. There is a radiation-induced darkening of the detector and a background noise limit beyond which the impact of ionizing radiation on the measurement becomes unclear. Tests show that after several measurement-anneal cycles, the RPL detectors reach a threshold value of intrinsic background, which causes measurements of small doses to be unreliable.

Keywords: Ag-doped phosphate glass ; radiophotoluminescence ; dosimetry ; background ; radiation-induced darkening

1. Introduction

The use of radiophotoluminescent (RPL) detectors for personal monitoring has changed the approach to personal dosimetry in France. Compared to other methods of radiation detection, the systems based on the RPL techniques are part of a category of dosimeters that having passed all the conformity tests (McWhan et al., 2015). Other authors (McKeever and Moscovitch (2003), Hsu et al. (2006), Ranogajec-Komor et al. (2008), Lee et al. (2009) and Olko (2010)) have reported advantages and disadvantages of using RPL dosimeters compared to Optically Simulated Luminescence dosimetry (OSLD) and Thermoluminescent dosimetry (TLD) for personal and environmental monitoring. All requirements of IEC (2012) for detection of γ, X and β radiation are satisfied by RPL dosimeters, with good performances in

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