OSL SIGNAL FADING OF NANODOT DETECTORS INDUCED BY DIFFERENT LIGHT CONDITIONS

Teresa C. N. O. Pinto[a,b], *Patrícia L. Antonio*[a], *Claudia C. Gronchi*[a,b] *and Linda V. E. Caldas*[a]

[a]Instituto de Pesquisas Energéticas e Nucleares, IPEN-CNEN/SP, São Paulo, Brazil
[b]Fundacentro, Ministério do Trabalho, São Paulo, Brazil
Email of corresponding author: nathan@fundacentro.gov.br

Introduction: The optically stimulated luminescence (OSL) technique has shown an alternative method for personal dosimetry, because it presents the characteristic to be commercially available for different materials. Al_2O_3:C consists of the best material example that presents OSL response, and adequate dosimetric behaviour for OSL dosimetry [1]. It was the first commercial material manufactured for use in personal monitoring based on an OSL reader system from Landauer. However, there is one potential limitation of the utilization of this material due to its high sensitivity to light, and this situation may represent a problem for its application in personal dosimetry. Gronchi et al [2] showed the fading of the OSL signal of Landauer Dot detectors due to light exposition. Benevides et al [3,4] reported a loss in the OSL response when the detectors were exposed to fluorescent and incandescent lighting conditions, even using a sealed commercially available OSL dosimeter. The purpose of this paper was to study the optical fading of the OSL signal of the Landauer Nanodot Al_2O_3:C detectors when exposed to light in different conditions.

Experimental: The Al_2O_3:C detectors (NanoDots, Landauer) were irradiated with 6 mGy of beta radiation and divided into five groups, and exposed in different ways and to different light sources. Some detectors were kept in the dark; other detectors were exposed to sun light, and to fluorescent and LED (light emitting diode) light sources. The OSL sensitive elements were exposed to light sources directly and covered with the manufacturer PVC cover. The OSL measurements were taken at the MicroStar System of Landauer.

Results and Discussion: A loss of the OSL signal was observed when the detectors were exposed to light in all tested conditions.

The assembled NanoDots, exposed to different light sources with their sensitive elements covered with the manufacturer PVC cover, presented a loss of signal when exposed to sun light ($1.0x10^5$ lux) and to fluorescent ($2.1x10^4$ lux) and to LED ($3.0x10^4$ lux), light sources. The loss ranged from 5% to 7% in 24 h of exposure. The detectors exposed to 270 lux (fluorescent light), positioned on a laboratory bench, presented only a mean signal loss of 2% in the same exposure time.

When the NanoDots were exposed to the different light sources with their sensitive elements directly, the OSL response, as expected, presented a much larger loss of signal, as can be observed in the figure.

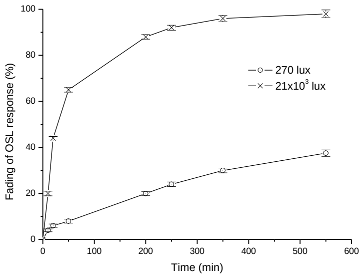

Fig 1 - Loss of the OSL signal of detectors with OSL sensitive elements exposed directly to a fluorescent lamp 270 lux (on a bench) and to a fluorescent lamp $2.1x10^4$ lux (inside a closed wooden box).

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