

Dosimetric Characterization of BeO OSL Detectors in Standard X Radiation Beams

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In recent years, the Optically Stimulated Luminescence (OSL) has become a usual procedure for determination of environmental radiation levels, absorbed doses of geological and archaeological materials for dating purposes; therefore, its application in diagnostic radiology is relatively recent.

Beryllium Oxide (BeO) has been used as OSL dosimeter presenting advantages as high sensitivity to ionization radiation, linear dose response and effective atomic number ($Z_{\text{eff}} = 7.2$) similar to human soft tissue ($Z_{\text{eff}} \sim 7.6$) [1].

The purpose of this work is the characterization of BeO detectors in standard X radiation beams using the OSL technique. This work includes OSL and TL measurements to compare their responses.

The BeO pellets have dimensions of 0.8 mm of thickness and 4.0 mm of diameter. The OSL and TL measurements were taken using a RISØ TL/OSL-DA-20 reader (Risø National Laboratory, Denmark). The OSL system parameters utilized were continuous wave OSL (CW-OSL), blue light emitting diodes (LEDs) and UV transmitting filters Hoya U-340 (transmission between 270 nm and 380 nm). The irradiations were carried out using an X-ray equipment, Pantak/Seifert, model ISOVOLT 160HS, operating up to 160kV. In this equipment several radiation beam qualities were established: radiotherapy, conventional radiology, mammography and radiation protection, in accordance to international recommendations. In this work the X radiation beam qualities, diagnostic radiology level, were utilized at the Calibration Laboratory, using as reference beams those recommended by IEC 61267 [2].

The performed characterization tests were: OSL response reproducibility, lower detection limit, dose-response curve, energy dependence, thermal quenching and thermal decay of the OSL signal.

- [1] L. Botter-Jensen, S. W. S. McKeever, A. G. Wintle. *Optically Stimulated Luminescence Dosimetry*, Elsevier, Amsterdam (2003).
- [2] International Electrotechnical Commission. IEC 61267: Medical diagnostic X-ray equipment- radiation condition for use in the determination of characteristics. Geneva (2005).