

Study of the luminescence properties of dental materials for their use in accidental dosimetry

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Abstract

The current social and political situation in many world areas and the increasing hostilities between countries and cultures have accentuated the risk of a malicious use of ionising radiations. Terrorist attacks with the intentional disseminations of radioactive materials in urban settlements may involve a large number of persons, and a rapid estimation of the severity of the exposure is required for undertaking suitable protective actions and supporting decision making.

Promising methodologies for a prompt dose evaluation, are those exploiting the luminescence and dosimetric properties of objects and materials which can be easily found in the contaminated area. Among these objects, dental materials have the advantage to be in contact with human body and they could therefore represent individual dosimeters in case of accidental exposure to ionising radiation.

The interest in the use of dental ceramics for dosimetric purposes dates back to late 1970, however, it is only through the use of high-sensitive experimental techniques and instrumentation today available, that the potentiality of such materials as accidental dosimeters can be exploited. Moreover, innovative materials are being continuously introduced into the market, containing new additives and pigments with peculiar optical properties.

In this study, Thermally Stimulated Luminescence (TSL) and Optically Stimulated Luminescence (OSL) techniques are applied to investigate the luminescence and dosimetric properties of several dental materials, including resins, glass and feldspatic ceramics, and also zirconia and alumina based ceramics, being their use widely increased in the recent years in substitution of metal cores.

KEYWORDS: *Dental ceramics, Accidental dosimetry, Thermoluminescence, Optically Stimulated Luminescence*

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