Performance of different materials as TSEE dosimeters in 90Sr+90Y radiation fields

M.L. Oliveira, F.D.G. Rocha and L.V.E. Caldas

Instituto de Pesquisas Energéticas e Nucleares
Comissão Nacional de Energia Nuclear

The application of the phenomenon of the thermally stimulated exoelectron emission (TSEE) was first proposed for radiation dosimetry in 1956. This method has been shown especially useful for low penetrating radiation detection. The exoeletrons have a range less than 10 nm, so the TSEE phenomenon provides dose information from extremely thin layers in detectors. Therefore, the TSEE technique is widely utilized for beta dosimetry. The 90Sr+90Y sources are commonly used in brachytherapy especially in treatments of superficial lesions, as in ophthalmic and dermatological procedures. These applicators can be plane or concave. Plane sources can be accurately calibrated using an extrapolation chamber but the calibration of concave plaques is more difficult because of the source geometry. In this case, the use of calibrated relative dosimeters is recommended, such as radiochromic films and thermoluminescent dosimeters. The aim of this work was to study the dosimetric characteristics of different materials as TSEE dosimeters to verify the possibility of their use for the calibration of plane and concave 90Sr+90Y applicators. In this work, six types of thermoluminescent dosimeters were utilized: LiF (TLD-100); CaF2:Dy (TLD-200); CaF2:Mn (TLD-400); thin CaSO4:Dy (IPEN); CaSO4:Dy + 10% graphite (IPEN); and CaSO4:Dy (IPEN). The samples were irradiated using a standard 90Sr+90Y source, Amersham Buchler, calibrated at the German primary dosimetry laboratory, Physikalisch-Technischen Bundesanstalt, PTB, and a 90Sr+90Y plane applicator (Amersham). The calibration curves, the stability and the linearity of the TSEE response of the radiation detectors were determined. The results obtained show the usefulness of all tested materials for beta dosimetry, using the TSEE technique.