

DOSE SENSITIVITY ENHANCEMENT ON POLYMER GEL WITH SUSPENDED GOLD PARTICLES

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The presence of high-Z materials adjacent to soft tissues, when submitted to irradiation, enhances locally the absorbed dose in these soft tissues. Such effects happen due to the outscattering of photoelectrons from the high-Z materials [1,2,3]. To investigate this effect, polymer gel dosimeters with suspended gold microspheres were used. This study was performed using the polymer gel dosimeter known as MAGIC [4].

The polymer gel was produced and divided into two parts. One part was uniformly mixed with gold microspheres at a concentration of 0.5 % by weight and the other part contained only polymer gel. Each part was poured into test tubes, 4 samples per dose were used, in a range from 0 to 6 Gy. The unirradiated samples were taken as control.

The samples were irradiated with X-rays generated at 150 kV, filtered with 4 mm Al and 5 mm Cu, at a constant air kerma rate of 18.9 mGy/min. All samples were read using a Bruker 9.4 T Magnetic Resonance scanner. The transversal relaxation rate R2 (measured in terms of $T2=1/R2$) from each sample (minus the R2 value from the control) was plotted against the nominal delivered dose to obtain the calibration curves. The samples containing polymer gel with gold microspheres presented approximately 20 % higher change of the R2 value per dose in comparison to the samples containing only polymer gel. This result indicates a dose enhancement factor of approximately 20 %. An analytic estimation predicted a dose enhancement factor of 30 %. The calculations are being refined for a closer description of the experimental parameters.

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