AbstractID: 3442 Title: Enhanced Performance of PRESAGE - Sensitivity, and Post-Irradiation Stability

Purpose: To improve the dose sensitivity and to control the post-irradiation radiochromic response of PRESAGE™ a 3D dosimeter.

Method and Materials: One cm plastic cuvettes were filled with formulations of PRESAGE™ that varied in the composition of leuco malachite green (LMG), a radical activator and a dissolution solvent. The dosimeters were irradiated using a Varian 600C linear accelarator with a 4 MV photon beam. The dosimeters were irradiated at doses ranging from 10cGy to 60 Gy (250 cGy/min) and measured on a Hitachi-Perkin Elmer 204 spectrometer at 630 nm. The absorbances were measured 10 minutes after irradiation and up to a week post-irradiation. The sensitivity of PRESAGE™ to room light was investigated by placing dosimeters in a laboratory under constant room light at 22 C for approximately 6 hr and periodically measuring the radiochromic response.

Results: The radiochromic response at 630 nm was linear from 0 to approximately 30 Gy with a slope of 0.16 OD/Gy and with an error, R^2, of 0.9995. The lower limit of dose measurement of the dosimeter is 10cGy. The stability of the post-irradiation radiochromic response can be varied with minor detectable radiochromic response loss after 7 days (<1%/24 hr) to nearly 100% loss of radiochromic response 24 hr. When exposed to room light the photochromic background increases 0.05 cm^{-1}/ hr.

Conclusion: The performance characteristics of PRESAGE™ have been enhanced by increasing the sensitivity of the dosimeter. The rate of thermal bleaching post-irradiation can be controlled by varying the ratios of the LMG to the radical activator and quantity of dissolution solvent. The ability to control the rate of losing the radiochromic dose distribution is an important characteristic for a potentially reusable dosimeter. Precautions must be taken to minimize the exposure of PRESAGE™ to room light.

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