

AbstractID: 2046 Title: Fast Kinetics Change of Radiochromic Film in Point-Based Ionizing Radiation Dosimetry System

The use of radiochromic dosimeters is complicated by the need to allow the optical density (OD) changes to stabilize. Changes in OD due to fast kinetics of polymerization in a radiochromic radiation-sensitive medium can be utilized to measure dose directly after exposure. The OD of the film is measured in real time using an optical fiber-based readout system. The results suggest that the rate of change in OD is proportional to the dose rate, and the net change proportional to the total given dose. The OD's rate of change exhibits different values prior to, during, and after radiation exposure. We developed a model using changes in OD rates to measure net OD change immediately after radiation exposure. We can relate these values to the total given dose, generating a corresponding calibration plot. A number of films were exposed to known radiation doses, and the net OD changes were measured using the same algorithm. Comparing the actual given doses with predictions (from film OD and the model-derived calibration plot) yielded a correlation coefficient >0.99 . This work underscores the importance radiation-induced polymerization kinetics as manifest in the OD rates of change, and suggests potentially novel uses of OD of radiochromic film that draw upon our understanding of these dynamic effects.

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