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FEASIBILITY OF REUSABLE RADIOCHROMIC PLASTICS AS DOSIMETER

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Feasibility of Reusable Radiochromic Plastics as Dosimeter

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ABSTRACT

New and improved developments in the field of radiotherapy have created extremely effective and efficient procedures for the treatment of tumors. Such developments require complex radiotherapy systems and plans which have ultimately improved the successfulness of treatments and improved the options available to patients. However, these advanced treatments present challenges for current dosimetric verification techniques which struggle to keep up. We will be examining radiochromic plastics as a way of addressing this conflict. Radiochromic plastics are synthetic materials whose optical properties change upon absorption of dose. The color darkens when the dose is absorbed, and the change in optical density is proportional to the dose absorbed. We examine a formulation which is designed to clear its response slowly after irradiation to determine if the formulation is reusable after it clears. If upon reirradiation the dose response remains linear, then reusability is an option. Our results show that the response remains linear over a range of five irradiations and a timespan of two years, but their sensitivity drops around 20% after the first reirradiation and less than that upon further irradiation. The plastics clear at an exponential rate, but the time it took to clear increased after each reirradiation. These results suggest that a long term reusable dosimeter is possible. Data on a faster clearing formulation will also be presented.

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