

PERGASCRIP ORANGE BASED POLYMERIC SOLUTION AS A DOSIMETER FOR RADIOTHERAPY TREATMENT PLANNING

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A radiation colour former of amino fluoran dye, pergascript orange (PGO), in polyvinyl butyral solution containing a colour developer, hexachloroethane (HCE), was prepared and investigated for radiotherapy dosimetry of ^{60}Co , 6 MV and 15 MV photons. PGO, a colourless fluoran compound, reacts with acid produced by radiation exposure of HCE, enabling the lactone ring to open and the orange colour of PGO to develop. This was confirmed by detecting a peak at 490 nm with two shoulders at 523 nm and 460 nm upon irradiation of the dosimeter solutions. The ring opening of PGO was also confirmed by appearance of a broad peak of OH- at 3360 cm^{-1} , C=O carboxylic at 1763 cm^{-1} , and Iminium group at 1640 cm^{-1} . Dose response functions of all prepared compositions are linear in the dose range of 1-20 Gy. Increasing HCE in the dosimeter matrixes enhanced significantly the radiation sensitivity. With an increase of HCE from 0.063 M to 0.106 M, the radiation sensitivity increases by 57.76%. The experimental results reveal an energy independent response in the range of 1.33-15 MeV. Based on a theoretical study, this dosimeter is water equivalent in the energy range from 80 keV to 20 MeV. The effective atomic number of the present dosimeter is 7.2 and comparable with water, where the effective atomic number is 7.4. Finally, the uncertainty parameters in absorbed dose were discussed and the overall uncertainty was found to be 4.3% at 95% confidence level.

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