

Enhancements in 3D dosimetry measurement using polymer gel and MRI

ABSTRACT

The effects of varying the concentrations of cross-linker N, N-methylene-bis-acrylamide (BIS) from 2% to 4%, and 2-hydroxyethylacrylate(HEA) monomer from 2% to 4% at 5% gelatin on the dose response of BIS–HEA–gelatin (BHEAG) aqueous polymer gel dosimeters have been studied using magnetic resonance imaging (MRI) for relaxation rate (R2) of water proton. The dosimeters were irradiated with ⁶⁰Co teletherapy -ray source at a constant dose rate, receiving doses up to 30 Gy. The radiation polymerization occurs and increases with increasing initial dose. R2 is found to decrease mono-exponentially with depth inside the polymer gel and depend strongly upon the initial concentrations of co-monomers (HEA and BIS). Dose–depth map for BHEAG gel was determined for different concentrations of co-monomer (HEA and BIS). The percentage dose depth was also evaluated which leads to a good agreement with the ionization chamber measurements.

Keyword: Polymer gel, Radiation, Relaxation rate, Depth–dose, Cross-linker