

Polymer gel dosimeters are tissue equivalent material that fabricated from radiation sensitive chemicals which, upon irradiation, polymerize as a function of absorbed radiation dose. Polymer gel dosimeters can uniquely record the radiation dose distribution in three-dimensions (3D). A novel composition of polymer gel dosimeters based on radiation-induced polymerization of N-(hydroxymethyl) acrylamide (NHMA) is introduced in this study for radiotherapy treatment planning. The dosimeters were irradiated by 10 MV photon beam of a medical linear accelerator at a constant dose rate of 600 cGy/min with doses up to 30 Gy. The polymerization degree is directly proportional to absorbed dose received by the polymer gel. Nuclear magnetic resonance (NMR) and nuclear magnetic imaging (NMR) were used to investigate the relaxation rate (R2) of water proton of irradiated NHMA gel which is associated to the degree of polymerization of polymer gel dosimeters. R2 increases with absorbed dose for all gel dosimeters in the dose range between 0 and 30 Gy. Dose rate, energy of radiation and the stability of the polymerization after irradiation were investigated. No appreciable effects of these parameters on the performance of the novel gel dosimeters were observed.