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SYNTHESIS AND CHARACTERIZATION OF PVP NANOGELS PREPARED BY GAMMA RADIATION USING 60Co SOURCE

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Nanogels are promising and innovative systems in nanometer scale, with particle size range varying from 0 to 100 nm, of great potential in nanomedicine, pharmaceutics and bio-nanotechnology. They present several advantages such as capacity of injection into the circulation reaching target tissues and ability to deliver their payloads locally and intracellularly. Nanogels are defined as two-component system on nanometer scale consisting of a permanent three-dimensional network of linked polymer chains, and molecules of a solvent filling the pores of this network. They are formed by intramolecular crosslinking that can be achieved by the use of ionizing radiation, this method allows the formation of nanogels free of additives, rendering them non-toxic, a fundamental requirement for biomedical application. In this work, five samples of nanogels were developed using a 25 mM PVP solution. The samples were saturated with argon and prepared in multipurpose cobalt-60 gamma irradiator using doses of 1, 2, 5, 10 and 25 kGy at a dose rate of 10 kGy/hour corresponding, respectively, to samples A, B, C, D and E. These samples were morphologically characterized using atomic force microscopy (AFM) as well as the pristine PVP solution. The mean particle size of the samples as well as the determination of polydispersity index was performed in equipment Zetasizer Nano ZS - Malvern® and the determination of radius of gyration and molecular weight was realized in equipment Heleos - Wyatt®. The mean particle size of the samples A, B, C, D and E, were, respectively, 41.89, 46.85, 61.04, 62.79 and 62.11 nm and the mean particle size of the pristine PVP solution was 43.28 nm. The AFM results revealed the presence of spherical nanostructures in the samples prepared with dose equal to or more than 5 kGy (samples C, D and E). Under the conditions evaluated in the study the morphological characterization of the nanogels revealed that the doses of 5 kGy, 10 and 25 kGy are the most suitable doses for the nanogel formation as it led to spherical structures when compared to the other conditions assayed.