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SUPERABSORBENT POLYACRYLAMIDE HYDROGELS OBTAINED BY TWO DIFFERENT CROSS-LINKING PROCESSES

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Superabsorbent hydrogels are materials formed by three-dimensional networks of hydrophilic polymers with the ability of absorbing and retaining huge amounts of water. The interest in such materials has increased worldwide because of their potential applications in bioengineering, food industries, biomedicine, separation processes, water purification, chromatography, agriculture and matrices for controlled release of drugs. This work aimed to obtain and characterize hydrogels from a commercial polyacrylamide (PAAm) by two distinct cross-linking processes: ?-radiation and glutaraldehyde as cross-linker. In these processes, cross-linking was investigated by varying the concentration of the polymer dissolved / moist in water, the concentration of the glutaraldehyde, and the ?-radiation dose. The results indicate that PAAm solutions with 1 % and 2 % of the polymer (w/w) do not cross-link under ?-radiation doses of 15 kGy and 25 kGy; differently, cross-linking performed with glutaraldehyde resulted hydrogels with swelling degrees of up to 55,000%. Water-PAAm mixtures at concentrations of 5%, 10%, and 20% (w/w) of the polymer were cross-linked under ?-radiation dose of 25 kGy produced hydrogels with swelling degrees of up to 70,000%. Nevertheless, at these PAAm concentrations, glutaraldehyde-cross-linked hydrogels weren't gotten, probably due to its low diffusion in non wholly homogeneous and extremely viscous systems. Thus, cross-linking density in such systems was rather insignificant. The ?-radiation process showed to be more efficient in the cross-linking of this type of PAAm dissolved / dispersed in water at concentrations of 5%, 10%, and 20%, whereas the glutaraldehyde efficiency in the cross-linking of this polymer has been achieved only in the aqueous solutions of PAAm at 1% and 2% concentrations., what promotes the macromolecules' mobility and glutaraldehyde diffusion in the medium, enabling, therefore, a minimum cross-linking density to form a hydrogel. Characterization of the hydrogels encompassed several assays: swelling in distilled water, gel fraction, FT-IR, SEM