

E-BEAM CROSSLINKED, BIOCOMPATIBLE FUNCTIONAL HYDROGELS INCORPORATING POLYANILINE NANOPARTICLES

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Objective of this research is to develop a functional soft nanocomposites platform that combines the electro-optic properties of conjugated polymer nanoparticles with process flexibility, highly hydrophilic character, 3D structure and biocompatibility of hydrogels, to yield novel soft materials with multi-application potential in diagnostic, therapeutic and regenerative medicine.

PANI aqueous nanocolloids in their acid doped, inherently conductive form, are synthesised by means of suitable polymeric stabilisers, i.e. water soluble polymers, that may prevent irreversible PANI particles coalescence and precipitation during synthesis and upon storage. Depending on the nature and concentration of the polymeric stabiliser, e.g. polyvinyl pyrrolidone (PVP), polyvinylalcohol (PVA) or chitosan (CT), PANI has been synthesised in form of nanoscalar rods, spherical particles or rice grains, respectively. In the present work, e-beam irradiation with a 12 MeV Linac accelerator has been tested, in alternative to gamma-rays, as a viable industrial methodology to generate hydrogel nanocomposites via *in-situ* crosslinking of the polymers already used to stabilise polyaniline nanocolloids, at low temperature, with no recourse to further addition of molecular weight chemicals and in a few minutes.

In these conditions nanoparticles morphology of PANI should be preserved and interesting electro-optical properties can be imparted. The swelling properties of the different hydrogel nanocomposites have been investigated at the variance of the chemical structure of the matrix material and of the pH of the swelling medium. UV-visible absorption and fluorescence spectroscopies demonstrate the retained optical activity of the dispersed PANI nanoparticles when incorporated in the hydrogels. Selected formulations have been also subjected to MTT assays and absence of cytotoxicity has been ascertained as the first necessary step to assess their biocompatibility.