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values were found to decrease down to 80 % of their original values with increasing dose up to 50 kGy for nylon 66 and nylon 6 tire cords, whereas almost unchanged for PET cords up to 80 kGy. The decrease in limiting viscosity numbers of nylon 6 and nylon 66 cords with increasing dose by both gamma and e-beam irradiations is attributed to oxidative degradation of the main chain which causes slight deterioration in the mechanical properties.
It is concluded that PET calendered fabric has higher resistance to ionizing radiation, and Ny 6 and Ny 66 calendered fabrics are more sensitive even at low doses. Therefore, the effects of high energy irradiation on tire cords have to be taken into consideration during tire design reinforced with particularly Ny fabrics if pre-vulcanization with high energy radiation is to be applied .

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IRAP080

Nitric oxide delivery from radiation-crosslinked hyperbranched polyglycerol hydrogels

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After two decades of study dendritic and hyperbranched polymers are becoming commercially viable raw materials for pharmaceutical industry. Structurally hyperbranched polymers are quite different from the conventional branched or linear polymers applications having a "globular" topology. This 3-dimensional shape leads to unique structure/property relationships and new opportunities for design of drugs. Some of the attractive features of dendritic polymers for medicinal applications include low viscosity at a given molecular weight and high-end group functionality concentration. The aim of this work was the synthesis and characterization of radiation crosslinked nitrated hyperbranched polyglycerol hydrogels (PGLD-NO) and the usefulness of this material for medicine applications such as wound dressings. Nitric oxide is an important cytotoxic agent for host defense that also regulates gene expression, signal transduction, and vasodilation. In normal wounds, nitric oxide synthesis and metabolism are significantly increased during inflammation and tissue remodeling. However, nitric oxide production is suppressed in wounds where healing is impaired by diabetes or steroid-treatment. The delivery of nitric oxide in therapeutic amounts may alleviate this deficiency and thereby enhance wound repair. Consequently, we developed a nitrated hyperbranched polyglycerol (PGLD-NO) radiation crosslinked a nonsoluble, nontoxic hydrogel as a new class of compounds that spontaneously release nitric oxide in a controlled fashion in aqueous media. The PGLD-NO was synthesized from glycerol to provide an extended nitric oxide release. PGLD-NO generation 5 was irradiated with gamma ray radiation from ^{60}Co at 25 °C and different doses (0-100 kGy). Irradiation of PGLD-NO in aqueous solutions at 30 wt% resulted in the formation of gels. Gel content was found to increase with increase of radiation dose and decrease of PGLD-NO concentration within the range studied. PGLD-NO gels swelled by absorbing more than 1,500 g of water per gram of dry gel at a low applied dose, characterizing a superabsorbent gel. Under physiological conditions, NO was produced by the PGLD-NO hydrogels over periods ranging from hours to months, depending upon the PGLD-NO formulation. The rate of wound healing in mouse treated with PGLD-NO hydrogels was elevated. The results showed that a nonsoluble, dendritic PGLD-NO could provide nitric oxide delivery to wounds in a controlled manner, which an enhanced wound healing.
{CNPq, Capes, Finep, Fapemig]

IRAP081

Boron containing polyglycerol dendrimer for BNCT treatment of leishmaniasis

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Boron-neutron-capture therapy (BNCT) is a promising type of cancer treatment, where boron compounds are incorporated into cancer cells and then irradiated with thermic neutrons. Under these conditions highly energetic particles ($_3Li^7$, $^4He^{2+}$) are formed which destroy cancer cells in the immediate vicinity. This work relates the use of a biocompatible boronated polyglycerol dendrimers for use in boron neutron capture to treatment of leishmaniasis. Leishmaniasis is a parasitic disease found in around the approximately 90 countries caused by obligate intracellular protozoa and is transmitted by the bite of infected female phlebotomine sand flies. The disease has two major forms: cutaneous leishmaniasis, which causes skin sores, and visceral leishmaniasis, which affects some of the internal organs of the body. It was disclosed that large quantities of boron presented as boron compound nanoparticles could be endocytosed by macrophages that would, upon administration, home to a site of disease. Once the boron had been carried to the target site, neutron bombardment could be used to produce radioactive decay of the boron with consequent local cytotoxic effects to leishmaniasis. However, the factors that determine the interaction and distribution of boronated PGLD within cells is unknown. We are now studying some of these mechanisms in mouse macrophages. Macrophages seemed particularly appropriate for such studies, since they can be readily maintained in vitro, allowing manipulation and quantitation not possible in more complex systems. The synthesis and biocompatibility studies of the boronated polyglycerol dendrimer for *in vivo* applications in BNCT therapy are described. Platelet adhesion, fibrinolytic activity and citotoxicity were conducted in *in vitro* experiments to examine the interaction of PGLD with biological cells. The potential of boronated PGLD to deliver boron and stimulate macrophages was assessed by studies of the phagocitosis of boronated nanoparticles by mouse peritoneal macrophages. The *in vitro* assays indicated that boronated PGLD nanoparticles had good biocompatible characteristics for *in vivo* applications. The morphologic alterations observed in macrophages structures suggested that cytoplasmic boronated PGLD may be transferred to granules in bulk by autophagic processes. The boron concentrations at therapeutic range in macrophages indicated that boronated PGLD is potentially a good candidate as boron carrier for leishmaniasis treatment by BNCT.

[CNPq, Capes, Fapemig, Finep]

IRAP082

Radiation-Processing of Natural Polymers: The IAEA contribution.

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Radiation processing offers a clean and additive-free method for preparation of value-added novel materials based on renewable, non-toxic and biodegradable natural polymers. It has been showed that under appropriate conditions, natural polysaccharides could be either degraded or crosslinked by radiation. The initial base material (origin, procedures used for cleaning, preparation etc.) and the irradiation conditions (physical form-solid state, paste-like state, solution-, dose and dose rate, humidity, temperature) influence the properties of the final product. The crosslinked natural polymers can be used as hydrogel wound dressings, face cleaning cosmetic masks, adsorbents of toxins and non-bedsore mats; while low molecular weight products show antibiotic, antioxidant and plant-growth promoting properties. The successful commercialization of such products in a number of IAEA Member States (MS) clearly indicate that radiation processing of natural polymers has emerged as an exciting area wherein the unique characteristics of these polymeric materials can be exploited for a variety of practical applications.

Recognizing the potential benefits that radiation technology can offer for processing of natural polymers into useful products, the IAEA held a number of technical meetings in this field and implemented a number of activities in response to MS requests for Technical Cooperation (TC) projects. To further facilitating the implementation of the research results and development in this field, the Malaysian Nuclear Agency (Nuclear Malaysia) was designated as IAEA Collaborating Centre on Radiation Processing of Natural Polymers in October 2006. The recommendation for further research needed to broaden the range of application for radiation processed natural polymers was discussed and inputs for the formulation of the coordinated research project (CRP) on "Development of Radiation-processed products of Natural Polymers for application in Agriculture, Healthcare, Industry and Environment" as well as the key issues that need to be addressed were provided by the participating experts in a consultants meeting.

The CRP was launched at the end of 2007 with participation of 16 MS with the following objective:

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