

“Use of low energy accelerator for the radiation vulcanization of natural rubber latex and nitrile rubber”
the battle for the sustainability and poverty alleviation

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Abstract

The origin of the *Hevea brasiliensis* tree was the Amazonian basin. The rubber expansion at the end of 19th century brought prosperity and determined the borders of Amazonian countries. In spite of that, the Brazilian government has failed in establishing a successful policy for improving the NR production in the jungle. This battle has been a continuous defeat against the environment as it was not possible to control the fungus *Microcyclus ulei* in its natural environment. The defeat was catastrophic for the population of Amazon region as they were not able to shift to other sustainable activity. As a consequence of the lack of economical options, the population had to explore all available natural resources. It has been also catastrophic for the Amazonian environment. Nevertheless, rubber plantations were successfully introduced in areas where *Hevea brasiliensis* was not native, mainly in the southeast of Brazil. And recently, it was also introduced near marginal areas of the humid forest in the Amazon due to the absence of the fungus *Microcyclus ulei*. Both, extraction of wild rubber and plantation have a key role in the maintenance of the forest health as the *seringueiros* not only have a sustainable activity but can also play a role as *soldiers of the jungle*. Actually, rubber activities are not only associated to the environment but also with poverty because the activities are labor intensive, so it needs cheap labor. The poverty is unfortunately spread out in rural areas of Brazil and in the peripheral areas of the big cities. Regarding environment and poverty the dilemma is critical in the Amazonian region and is the following: the forest should be maintained healthy and protected from devastating projects and at the same time needs of the inhabitants should be considered.

Sustainable activities are a possible solution for this dilemma. This proposal of future work aims to introduce an advanced technology to produce very pure latex products compatible with international standards in rural areas where latex is available. This technique should afford products free from allergenic compounds like nitrosamines and proteins. The

proposed process should be simple to be performed by workers without special training, reliable to avoid maintenance and to cope with specifications. The vulcanization process must be extremely energy efficient as energy is a scarce resource in remote areas. So, the use of new advanced low energy electrons beams are proposed to the manufacture of gloves, condoms and balloons by dipping process, cushion using natural fibers from each region and supported rubber products as fiber supported vegetal leather or gloves.

In this paper we are going to present our results for the development of cotton gloves supported with nitrile (NiR) and natural rubber latex (NRL). Those products were manufactured by dipping process from radio vulcanized NiRL and NRL using gamma rays from 60-Cobalt industrial irradiator. In order to completely skip from the traditional sulphur-heat process, the formulation was modified using radiation sensitizer as presently used in radiation vulcanization natural rubber latex industrial process.

This process is simpler, cheap and easy to control, when compare with the thermal vulcanization in the presence of sulphur and ZnO. There is no pre-cure and post-cure step, as the vulcanization occurs during the irradiation step and the room temperature.

Modified NiRL/ NRL of varying n-butyl acrylate content were prepared and irradiated for 10, 20, 30, 40 and 50 kGy followed by coagulation with casting process. The effect of radiation dose on the tensile strength was observed. As the radiation dose increased, this mechanical property decrease. In order to improve the industrial process to nitrile rubber radio vulcanization was formulated with 1phr of n-butyl acrylate and 10kGy irradiation dose.

Another hand we are going development a technique to manufacture rubber band using the RVNRL – Radiation Vulcanization Natural Rubber Latex process. The technique is similar to manufacture rubber tube using termosensitizer add to radio vulcanized and hypoallergenic NRL. We was produced hypoallergenic NRL to reduction of protein from RVNRL by combination effect of water-soluble polymers addition and centrifugation.