Title: Application of ionizing radiation and shear for recovery/recycling of butyl rubbers

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I. Abstract Body

Polymeric materials (plastics and rubber) have been contributing in a continuously and raising way for the generation of litter and industrial wastes discarded in landfills. The implementation of new technologies for the reduction of polymeric materials, acceptable from the environmental viewpoint and at an effective cost, proved to be a great problem, due to complexities inherent for the re-use, especially of rubbers. Gamma ionizing radiation has capacity for changing structure and properties of polymeric materials and can be applied to almost all types of polymers; irradiation is an expectation for problem solving of rubber wastes that can be utilized as raw materials or chemical additives. Due their properties, butyl rubber is widely used industrially and particularly in tires. At the initial stage of irradiation the degradation of butyl rubber occurs predominantly via random chain-scission and chain-crosslinking may occur caused from the isoprene copolymerized units. This work aims to the introduction of a new recovery technique for butyl rubber, by using processing via gamma-rays followed by shear. 5, 15, 25, 50, 100, 150 and 200 KGy doses were used, in order to study the feasibility of butyl rubber for recycling. Doses within 5 to 25 kGy applied to butyl rubber and further shear pointed toward a less degraded material, indicating that this type of elastomer is able to be incorporated to a new rubber compound and replacing some parts of pristine rubber in formulations.

II. Image:



III. Reference:

1 Agrawal, S.L.; Bandyopadhyay, S.; Dasgupta, S.; Mukhopadhyay, R. (2008, January 1). Prediction of dynamic mechanical properties for tire tread compounds The Free Library.

2. Karaagaç, B; Sen, M.; Deniz, V.; Güven, O., 2007. Recycling of gamma irradiated inner tubes in butyl based rubber compounds. Nuclear Instruments and Methods in Physics Research, B.65, 290-

3. Hill, D.J.T.; O'Donnel, J.H.; Perera, M.C.S.; Pomery, P.J.,1995. High energy radiation effects on halogenated butyl rubbers. Polymer. 36, 4185-4192.

IV. Biography:

In 2013, she completed his PhD, defending the thesis on elastomer recycling, in Institute of Energetic and Nuclear Research and in 2015 completed the postdoctoral fellowship in Ipen// Eletronuclear agency. Actually, she is a major coordinator of a new research project on rubber recycling in Ipen/CNEN.. She has published around 15 papers in prestigious journals and acts as a reviewer of articles including the evaluation for the Rubber Chemistry and Technology Journal and the Journal Radiation Effects and Defects in Solids.

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