Evolution of the properties in multilayer films cross-linking by beta irradiation.

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Abstract

This study reports on the morphological and chemical changes, together with the evolution of mechanical properties and gas barrier performance produced by beta irradiation on multilayer thin films in Low Density Polyethylene (LDPE) base. The effect of the irradiation dose on the aformentioned properties is discussed. It is expected to achieve the economic evaluation of the crosslinking treatment through irradiation, as well as the viability analysis of its integration into the industrial processing of multilayer films, as a way to adjust the materials properties to the customer's demands.

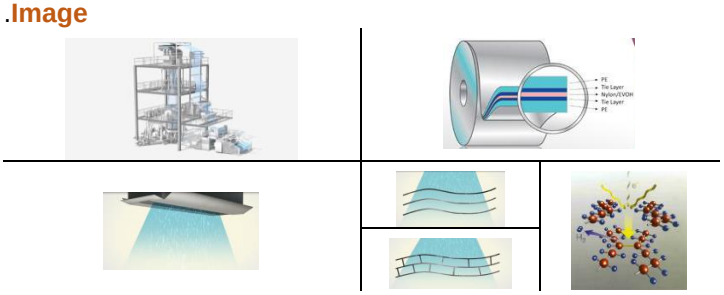
Polyolefins, in particular polyethylene (PE) synthesized by means of traditional Z-N catalysts and state-of-the-art metallocene catalysts will be used as base materials. It is intended to use the polyolefin in a film or film structure, obtained from conventional and commercial market grades low density polyethylene (LDPE), providing several slopes of flow index between 0.2 and 4 gr / 10 min, and possible combinations with linear low density polyethylene (LLDPE).

Irradiation (emission and propagation of energy through space or a material medium) capable of transferring to the irradiated material sufficient energy to cause its ionization, resulting in a cross-linking that modifies its morphological chemical structure and leads to a modification of solid state properties will be applied to the film materials. The structural modifications affect the crystallization capacity of the material, its optical properties, permeability to oxygen as well as the mechanical properties. Properties that are studied together with the estimation of the final cost of the product to be specified based on the following sections: The resulting properties will be match to the specific demands of the food packaging chains.

Type of polymer.
Shape and thickness of the piece to be treated.
Dose of ionizing radiation applied.

Acknowledgements: Financial support of Universidad de Cantabria-Parlamento de Cantabria to project "DESARROLLO Y CARACTERIZACIÓN DE FILMES MULTICAPA EXTRUIDOS EN BASE POLIMÉRICA APLICADO AL TRATAMIENTO DE ENTRECRUZAMIENTO MEDIANTE RADIACIÓN IONIZANTE" is gratefully acknowledged

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Recent Publications

(1) Nur Ashiela Abdul Manaf. 2013-2014, "Industrial Application of electron beam – Crosslinking", Project BSC PHYS 379.
(2) Marshall R. Cleland. 2015, "Industrial Applications of Electron Accelerators", IBA Technology Group151 Heartland Boulevard Edgewood, New York 11717Presented at the CERN Accelerator School Accelerator CourseZeegse, Netherlands.
(3) (KOHJ-N) KOHJIN FILM & CHEM CO LTD. 2014. "Polyethylene-type crosslinked shrink film used for shrink-packaging material is obtained by crosslinking structure layers including core layer and two surface layers, irradiating with electron beam, and stretching". Patent: JP2014223808 A 20141204 DW201482.
(4) E. Suljovrujic, 2010. "Dielectric study of post-irradiation effects in gamma-irradiated polyethylenes", Radiation Physics and Chemistry 79 751–757.
(5) Keizo Makuuchi , Song Cheng .2012 , "Radiation processing of polymer materials and its industrial applications", John Wiley & sons INC first edition



R. Benavente (150 word limit)

Rosario Benavente, research Professor at the Institute of Polymer Science and Technology, ICTP-CSIC at the Spanish national Research Counsil in Madrid. My research activity has been directed to the field of polyolefins in connection with industrial interest. I have participated in the development of new models (linear high density polyethylenes, copolymers and terpolymers), research in the field of composite materials and nanomaterials, polymers, liquid crystals and more recently in the field of biodegradable polymers for biomedical applications.

My area of expertise is the thermal characterization, spectroscopic techniques and mechanical properties. I have published more than 150 papers in SCI journal, attended numerous national international conferences of recognized standing and I co-directed six PhD theses.

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Notes/Comments: