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A COMPARISON BETWEEN CHEMICAL AND PHYSICAL PROCESS FOR LDPE FOAMS

E.C.L.Cardoso¹, S. R. Scagliusi^{1*}, D.F.Parra¹, A. B. Lugão¹

1 Instituto de Pesquisas Energéticas e Nucleares (IPEN), Centro de Química e Meio Ambiente, Av. Prof. Lineu Prestes, 2242 – Cidade Universitária - Zip Code 05508-900, São Paulo/SP - Brazil.

**Corresponding author: eclcardo@ipen.br*

Foams are created by first dissolving and mixing a gas in the molten polymer, secondly expanding the gas into a lot of small bubbles or cells and finally cooling the expanded polymer and thereby creating the final foam. The foam can be shaped into different semi-finished products such as tubes, profiles, sheets and blocks; expansion results in a substantial reduction of polymer density. Polyethylene (PE), as raw material for the foam, has typically a specific density of 920 kg/m³ and density for PE foams are able to show a weight reduction, expanding the PE approximately 30 times. But not only the weight is changed during the foam process; new properties gained by the PE in its foamed state are responsible for many applications of this product. Two major foaming methodologies are employed for PE foam production: reactive foaming, where final foam products are yielded from a chemical reaction that initially involves a certain amount of gases, from the decomposition of a chemical blowing agent (CBA), and soluble foaming, that involves the dissolution of a physical blowing agent (PBA), in the polymeric melt. As CBA it will be used Azodicarbonamide, that evolves 220 cm³ /g of gas and leaves a white residue, odorless, nontoxic and nondiscoloring and as PBA, carbon dioxide, an eco-friendly gas, that presents an acceptable solubility and diffusivity in polymers. This work aims to a comparative study between chemical and physical blowing process, from a LDPE exhibiting 2.6 g/10 min Melt Index, gamma-irradiated within a 0 to 30 kGy range. It is known that cells morphology for foams obtained from chemical process are not as regularly distributed as in case for those ones obtained from physical process; this will be investigated by SEM analyses, besides other ones, as: DSC, Gel-Fraction, Swelling-ratio, Oscillatory Rheometer, Melt Strength and Mechanicals.