BIODEGRADABILITY OF PP/HMSPP AND NATURAL AND SYNTHETIC POLYMERS BLENDS IN FUNCTION OF GAMMA IRRADIATION DEGRADATION

Elisabeth C. L. Cardoso*, Sandra R. Scagliusi, Luis F.C.P.Lima, Nelson R. Bueno, Antonio J. C. Brant, Duclerc F. Parra, Ademar B. Lugão

Instituto de Pesquisas Energéticas e Nucleares- IPEN/CNEN-SP – Av. Lineu Prestes 2.242 - CEP05508-900 - Cidade Universitária, São Paulo/SP- Brasil.
**e-mail eclcardo@ipen.br*

Polymers are vastly employed for numerous purposes in different industrial segments, generating enormous quantities of discarding in the environment. Amongst the various components of waste in landfills, polymeric materials composites account for an estimated from 20 to 30% of total volume of solid waste disposed [1]. Polypropylene (PP) undergoes crosslinking and extensive main chain scissions when submitted to ionizing irradiation; and both chemical phenomena are known to induce changes in the polymer properties which may enable its use in various applications at distinct process conditions [2][3].
PP, expressed as C_nH_{2n}, is one of the most widely used linear hydrocarbon polymers; its versatility arises from the fact that it is made from cheap petrochemical feed stocks through efficient catalytic polymerization process and easy processing to various products. Thus, enormous production and utilization of polymers, in general, lead to their accumulation in the environment, since they are not easily degraded by microorganisms, presenting a serious source of pollution affecting both flora and fauna. These polymers are very bioresistant because the involvement of only carbon atoms in main chain with no hydrolysable functional group. Non-degradable plastics accumulate in the environment at a rate of 25 million tons per year. Several possibilities have been considered to minimize the environmental impact caused by the use of conventional polymers. Polymeric materials can undergo physical, chemical, and biological degradation or combination of all these due to the presence of moisture, air, temperature, light (photodegradation), high energy radiation (UV, gamma radiation) or microorganisms (bacteria or fungi) [4][5]. There are three main classes of biodegradable polymers: synthetic polymers, naturally occurring processable bacterial polymers, and blends of polymers in which one or more components are readily consumed by microorganisms [6]. This work aims to biodegradability investigation of a PP/HMSPP 50% mixture blended with sugarcane bagasse (natural polymer) and PHB and PLA (synthetic polymers), at a 10% level, all of them previously undergone to gamma radiation with doses of 50, 100, 150, and 200 kGy. Characterization prior and after irradiations will comprise: IR, DSC, TGA, OIT, Laboratory Soil Burial and CO_2 evolution via Bartha respirometer method, in order to determine the influence of gamma irradiation on samples biodegradability.

References.

1. C.Longo, M.Savaris, M.Zani, R.M.Brandalise, A.M.C.Grisa (2011); Degradation Study of Polypropylene (PP) and Biooriented Polypropylene (BOPP) in the Environment *Materials Research* **442-448**, 14(4).
2. A.Yoshiga, H.Otaguro, D.F.Parra, L.F.C.P.Lima, A.B.Lugão (2009); *Polym.Bull.* **397-409,** 63.
3. A. G. Chmielewski, M. Haji-Saeid, S. Ahmed (2005) *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms,* **44,** 236.
4. J.Arutchelvi, M.Sudhakar, A.Arkatkar,M.Doble, S.Bhaduri and P.V.Uppara (2008); *Indian Journal of Biotechnology*, **9-22,** 7.
5. D.S.Rosa, B.L.M.Franco, M.R.Calil (2001), *Polímeros: Ciência e Tecnologia*, **82-88**, 11.
6. Chandra,R ; Rustgi, R (1997); *Polym. Degrad.Stab.* **185***,* 56.