World Academy of Science, Engineering and Technology
International Journal of Chemical and Materials Engineering
Vol:9, No:01, 2015

Impact of Natural Degradation of Low Density Polyethylene on Its Morphology

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Abstract : A challenge of plastics industries is the realization of materials that resist the degradation in its application environment, and that to guarantee a longer life time therefore an optimal time of use. Blown extruded films of low-density polyethylene (LDPE) supplied by SABIC SAUDI ARABIA blown and extruded in SOFIPLAST company in Setif ALGERIA , have been subjected to climatic ageing in a sub-Saharan facility at Laghouat (Algeria) with direct exposure to sun. Samples were characterized by X-ray diffraction (XRD) and differential scanning calorimetry (DSC) techniques after prescribed amounts of time up to 8 months. It has been shown via these two techniques the impact of UV irradiation on the morphological development of a plastic material, especially the crystallinity degree which increases with exposure time. The reason of these morphological changes is related to photooxidative reactions leading to cross linking in the beginning and to chain scissions for an advanced stage of ageing this last ones are the first responsible. The crystallinity degree change is essentially controlled by the secondary crystallization of the amorphous chains whose mobility is enhanced by the chain scission processes. The diffusion of these short segments integrates the surface of the lamellae increasing in this way their thicknesses. The results presented highlight the complexity of the involved phenomena.

Keywords : Low Density poly (Ethylene), crystallinity, ageing, XRD, DSC
Conference Title : ICMCE 2015 : International Conference on Materials and Chemical Engineering
Conference Location : Jeddah, Saudi Arabia
Conference Dates : January 26-27, 2015

Open Science Index, Chemical and Materials Engineering Vol:9, No:01, 2015 publications.waset.org/abstracts/20663/pdf