

BEHAVIOR OF LINEAR LOW DENSITY POLYETHYLENE FILMS UNDER UV AGEING FOR AGRICULTURAL APPLICATION

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Polyethylene is the most important polymer used in agricultural applications. Polymers are susceptible to changes in their chemical structures that affect their mechanical properties under weather condition. In Polyethylene, photo-oxidation can occur because of impurities or chromophore groups (catalytic residue, mineral fillers, some commercial additives as stabilizers, lubricants, plasticizers). The critical ageing factors for greenhouse built with LDPE film are: total solar radiation, air temperature, relative humidity, mechanical stress, agrochemicals, air pollution, and combinations of these factors. Exposure of plastics to UV radiation causes a loss in their mechanical properties and/or change in appearance, including reduced ductility, color changes, yellowing and cracking. Additives are added to plastics to enhance the durability of the final product. Today, there are several additive systems (light stabilizers) developed to work according to resin, final application, type of cultivation, and other characteristics. The main types of light stabilizers are: UV absorbers, quenchers and free radicals scavengers. In addition to the conventional organic additives, some inorganic additives were obtained recently with the development of nanotechnology. This study evaluates the different additive systems (HALS, NPCC, nZnO and nTiO₂), applied 0.25% (in weight) in LLDPE. The samples were mixed by high rotation homogenizer and extrusion. Later, the samples were molded by injection and aged in QUV-B simulating 6 months of exposure to weather. Tests of FT-IR and tensile strength comparing to the non-aged samples were carried out in order to evaluate the performance of several additive systems concerning the degradation behavior of linear low density polyethylene.