

Eng. Alyaa Hussain Abd Alsalam, Study the addition of Titania particles on them physical properties of binary blends

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ABSTRACT

The present work was carried out in two stages. The first stage was concerned with study of blending ratio effect on the physical and morphological properties of the polymer materials involved plain polymers(HDPE, LDPE and PP) and binary blends (HDPE:PP and LDPE:PP) at different ratios (20,40,60 and 80wt%). The second stage was concerned with studying addition effect of Titania nano particles at different ratios (2, 5 and 8 wt %) on the optimum ratio of polymer blends (20HDPE:80PP and 20LDPE:80PP).

- Blends were prepared as strips by single screw extruder and pressed to prepare the samples according to ASTM specification. Tensile Results showed increment of (tensile strength, Fracture strength and Young Modulus) as PP wt% increased in polymer blend while elongation property recorded decrement. It has been also recorded that 20:80 ratio of both binary blends HDPE: PP and LDPE: PP have the best properties compared with other ratios.
- Moreover bending modulus and creep modulus increased as PP content increased while fracture toughness recorded changeable behavior as PP content is increased and the highest value recorded was for the ratio of 60HDPE:40PP and 40LDPE:60PP.
- Results of hardness test Shore D and Shore A showed increase as the weight ratio of PP increased, also the highest value has been recorded for the blend (20HDPE:80PP) which were 74 and 95.6 for Shore D and A respectively.
- Physical properties (density and thermal conductivity) showed also increase as PP wt% increased in both types of blends.
- By comparing the results obtained from the mechanical tests and some physical properties of prepared samples, it has been noted that the blend HDPE: PP gave the best results, also it was noted that the best mixing ratio for both blends is 20PE:80PP which it has been

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selected as a matrix material for preparing composite materials in the second stage of the research.

By examining the physical properties of blend composites, these were observed:-

- Results of polymer blend composites recorded that mechanical properties (Ultimate strength, Young modulus, bending modulus, shore hardness and creep modulus) increased as nano Titania content increased while elongation decreased.
- Furthermore, impact strength and fracture toughness results recorded highest value at 2%wt TiO₂ which is 312.5 Mpa and 572.8 Mpa respectively for the polymer blend (20HDPE:80PP) and 262.5 Mpa and 468Mpa respectively for (20LDPE:80PP) blend.
- Physical properties (density and thermal conductivity) results of the blend composites showed increment in the values as titanium dioxide weight ratios increased.
- Through the examination of micro structure of composites and their blends by SEM, it was noted that there are some areas showing separation of phases from the continuous phase. Moreover, these mixtures are not free of full compatibility between phases.
- Surface modification took place when blend composites and their matrixes were irradiated by UV, depending upon the loading of reinforcement and polymer blends matrix. However, these SEM photographs clearly show some cracks and appearance of little disintegration in surface morphology of these samples.
- Shore D hardness results of irradiated samples indicted that there is increase in values as a result of UV radiation.

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