

尼龙 66/紫外辐照线性低密度聚乙烯共混物的力学性能

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通过紫外辐照实现了高密度聚乙烯 (HDPE) 的官能化, 改善了 HDPE 复合材料的性能^[1-3]。本工作采用傅立叶红外 (FT-IR)、X 射线光电子能谱 (XPS)、凝胶、熔融指数和水接触角测试等研究了紫外辐照对线性低密度聚乙烯 (LLDPE) 化学结构和性能的影响。紫外辐照后, 在 LLDPE 的分子链上引入了 C=O、C-O 和 C (=O) O 等含氧基团, 其含量随辐照时间延长而增加。凝胶分析结果表明, 紫外辐照过程中, LLDPE 产生凝胶, 其含量随辐照时间延长而明显增加。这说明 LLDPE 在官能化的同时还发生了交联反应。LLDPE 的熔融指数 (MI) 随紫外辐照时间延长而下降, 在辐照 24 h 时出现最小值。然后, 随紫外辐照时间的进一步延长其熔融指数有所提高。由于辐照 LLDPE 的分子链上引入了 C=O 和 C-O 等含氧基团, 它的极性增大, 亲水性提高, 因此水接触角变小。可以通过控制辐照时间来调节辐照官能化 LLDPE 的亲水性, 进而调整、改善辐照官能化 LLDPE 与尼龙 66 (PA66) 之间的相容性, 从而制备力学性能良好的 PA66/LLDPE 共混物。力学性能测试结果表明, PA66/辐照官能化 LLDPE 共混物的力学性能明显优于 PA66/LLDPE 共混物。

关键词 线性低密度聚乙烯, 紫外辐照, PA66/LLDPE 共混物, 力学性能

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Studies on LLDPE functionalized by ultraviolet irradiation and mechanical properties of PA66/irradiated LLDPE blends

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The effect of UV irradiation on the structure and properties of linear low-density polyethylene (LLDPE) and the mechanical properties of nylon 66 (PA66)/LLDPE blends were studied with FTIR and XPS, measurements of gel, melt index, and water contact angle, and mechanical property tests. The results show that oxygen-containing groups such as C-O, C=O and C (=O) O were introduced onto molecular chains of LLDPE by the UV irradiation in air without adding any additives. The content of these groups increased with irradiation time. Gel formation was found in LLDPE after 12 h UV irradiation, and the gel fraction increased with the irradiation time. Melt index and water contact angle of the irradiated LLDPE decreased. Due to the introduction of the oxygen-containing groups, interfacial interactions between PA66 and the irradiated LLDPE increased. Therefore mechanical properties of PA66/irradiated LLDPE blends were improved compared with PA66/LLDPE blend. Tensile strength and notch impact strength of the PA66/irradiated LLDPE blends increased with irradiation time.

KEYWORDS LLDPE, UV irradiation, PA66/LLDPE blends, Mechanical properties

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