

# Compatibilization of LDPE/PP Waste Blends Using Acrylamide-Functionalized Phenol- Formaldehyde

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## Research Article

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# Abstract

This research focuses on improving the processability of mixed polyolefin waste by reactive extrusion of waste-derived low-density polyethylene (LDPE) and polypropylene (PP) with an acrylamide-functionalized phenol-formaldehyde (AF-PF) compatibilizer. The compatibilizer was specifically synthesized to enhance interfacial adhesion and promote uniform phase dispersion within the immiscible blend. Thermal analysis confirmed that AF-PF remained stable at the processing temperature of 190°C, maintaining its structural integrity during melt blending. The incorporation of AF-PF led to a transition from distinct, phase-separated melting peaks to a more unified thermal response, indicating enhanced phase interaction. SEM imaging revealed that the blend morphology shifted from coarse, heterogeneous domains to a finer and more continuous microstructure. Rheological characterization showed a marked decrease in melt flow rate, reflecting increased viscosity and improved cohesive strength within the matrix. Additionally, higher density values observed in the modified samples suggested the formation of a more compact and integrated structure. Collectively, these findings confirm the effectiveness of AF-PF in compatibilizing LDPE/PP blends, enabling the transformation of mixed polyolefin waste into structurally robust thermoplastic materials. This approach offers a promising pathway for advancing the upcycling of unsorted plastic waste into higher-performance applications.

## Introduction

PE and PP are commonly used in similar product applications—such as packaging films, containers, and consumer goods—and are therefore often discarded together. As a result, they routinely enter the waste stream as mixed fractions, originating from the same sources rather than from post-sorting aggregation [1–3]. This co-occurrence significantly complicates downstream separation processes [4].

Beyond the challenges of physical separation, polyethylene (PE) and polypropylene (PP) also exhibit fundamental chemical incompatibility that further complicates their joint recycling [5–8]. Although both are classified as non-polar polyolefins, they differ markedly in terms of crystallinity, molecular weight distribution, chain branching, and surface free energy. These differences result in thermodynamic immiscibility during melt processing, preventing the formation of a uniform, continuous phase [9–13]. When blended without a compatibilizer, PE and PP tend to segregate into distinct polymer domains with minimal molecular-level interaction [14]. This leads to poor interfacial adhesion and weak stress transfer between phases, ultimately producing heterogeneous materials with compromised mechanical integrity. Such blends often show poor impact resistance, limited elongation, and delamination under mechanical stress, severely limiting their potential for reuse in demanding applications [15–17].

The morphological consequences of this incompatibility are clearly demonstrated for the unmodified LDPE/PP blend [17]. These blends typically exhibit pronounced phase separation, with irregular interfacial boundaries and discontinuous domains that act as weak points under mechanical stress. Recent studies have shown that improving interfacial adhesion through compatibilization significantly enhances tensile and impact strength in LDPE/PP [18]. Moreover, reactive compatibilization approaches

- such as the in-situ formation of copolymers by reactive extrusion are effective in reducing interfacial tension and producing finer, more uniform morphologies [19]. Structure-property analyses also suggest that even minor differences in crystallinity and rheological behavior between the constituent polymers can exacerbate phase separation and limit mechanical integration [20].

Therefore, achieving a synergistic morphological and mechanical balance in PE/PP blends depends critically on the selection and design of compatibilization strategies. Therefore, addressing the interfacial weakness between LDPE and PP remains a critical step toward improving the recyclability and performance of polyolefin-based waste materials [21–24].

Given these challenges, there is an urgent need for effective compatibilization strategies that can mitigate the negative effects of LDPE/PP immiscibility. Our research explores a novel compatibilization route using a tailor-made acrylamide-functionalized phenol-formaldehyde (AF-PF) co-oligomer.

By focusing on this novel AF-PF compatibilizer, our study aims to demonstrate a viable upcycling route for unsorted LDPE/PP plastic waste, eliminating the need for costly separation and enabling the development of higher-performance, sustainable polyolefin materials.

## **Experimental**

### **Materials**

Low-density polyethylene (LDPE) and polypropylene (PP) waste granules were obtained from STP Polymer LLC (Sumgait, Azerbaijan). The materials were mechanically cut into small particles (approximately 3–5 mm in size) to ensure uniform feed during processing. Prior to blending, the polymers were thoroughly dried in a laboratory oven at 100°C until constant mass was achieved, ensuring complete removal of moisture.

### **Synthesis of Acrylamide-Functionalized Phenol-Formaldehyde (AF-PF)**

The acrylamide-functionalized phenol-formaldehyde (AF-PF) was synthesized at the Department of Organic Substances and High Molecular Compounds Technology, Azerbaijan State Oil and Industry University (ASOIU), using a step-growth condensation method. Functionalization was carried out by introducing acrylamide moieties into the phenol-formaldehyde resin framework under controlled conditions to enable targeted interfacial interactions during blending.

### **Characterization of the AF-PF Compatibilizer**

Fourier-transform infrared (FTIR) spectroscopy was employed to confirm the successful incorporation of acrylamide groups into the phenol-formaldehyde backbone. Spectra were recorded using a Thermo

Scientific Nicolet iS10 FTIR spectrometer at the Institute of Catalysis and Inorganic Chemistry. The presence of key functional groups, such as N–H and C = O stretching vibrations, was used as evidence of acrylamide functionality in the synthesized oligomer.

Thermal properties of both the AF-PF compatibilizer were evaluated using thermogravimetric analysis (TG) and differential thermal analysis (DT). These measurements were conducted at the Institute of Catalysis and Inorganic Chemistry under controlled atmospheric conditions. This analysis provided insight into the degradation behavior and thermal stability of the compatibilized blends compared to the unmodified samples.

## **Preparation of LDPE/PP Blends with AF-PF Compatibilizer**

Blending of LDPE and PP with the AF-PF compatibilizer was carried out using a HAAKE MiniLab micro-compounder at Charles Sadron Institute in Strasbourg, France. A fixed LDPE/PP weight ratio of 50:50 was used in all base formulations. The AF-PF compatibilizer was added at concentrations ranging from 2 to 8 wt% relative to the polymer blend. The reactive extrusion process was performed at 190°C with a constant screw speed of 30 rpm to ensure uniform dispersion of the compatibilizer within the polymer matrix. The extrudate was cooled, pelletized, and stored in sealed containers for subsequent characterization.

## **Characterization of PE/PP Blends Modified with AF-PF Compatibilizer**

Scanning electron microscopy (SEM) was employed to investigate the morphology of the compatibilized polymer blends. The analysis was conducted using a Hitachi SU8000 field emission SEM at the Charles Sadron Institute in Strasbourg, France. Cryogenically fractured surfaces of the LDPE/PP samples modified with AF-PF were examined. Prior to imaging, samples were coated with a thin conductive layer to prevent charging under the electron beam. Micrographs were captured under a low accelerating voltage of 2.0 kV to ensure high-resolution imaging without damaging the polymer surface. Two magnification levels were utilized for detailed analysis of the fracture surface. The obtained images were used to evaluate the dispersion of polymer phases and the interfacial compatibility induced by the AF-PF compatibilizer.

Thermal characterization of the AF-PF compatibilizer and its blends with LDPE/PP was conducted using differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA) at the Charles Sadron Institute in Strasbourg, France. For DSC measurements, samples were subjected to a standard thermal protocol involving a heating cycle from 25°C to 200°C at a rate of 10°C/min, followed by cooling to 0°C and a second heating to 200°C at the same rate, all under a nitrogen atmosphere. The thermal transitions observed during these cycles were used to assess melting and crystallization behavior. TGA was carried out by heating the samples from ambient temperature up to 800°C at a constant rate of

10°C/min in a nitrogen atmosphere with a flow rate of 50 mL/min, enabling evaluation of thermal degradation patterns and stability. Both analyses were performed using high-precision instrumentation at the institute, and the results provided critical insight into the thermal resilience and structural integrity of the compatibilized polymer systems during processing.

The bulk densities of both the unmodified and AF-PF-modified LDPE/PP blends were measured using Archimedes' principle, applying ethanol as the displacement medium. The Anton Paar DMA 35 digital density meter was used for this purpose at STP Polymer LLC (Sumgait, Azerbaijan). Density values were calculated from the mass difference between air and ethanol immersion using the standard formula:

$$\rho = \frac{\text{Mass in air}}{\text{Mass in air} - \text{Mass in ethanol}} \times \rho_{\text{ethanol}}$$

Melt flow rate (MFR) analysis was carried out to investigate the rheological behavior of the blends. Both unmodified and AF-PF-modified LDPE/PP samples were tested at 190°C under a load of 2.16 kg using a Ceast MFR tester, following the ASTM D1238 standard. MFR values (g/10 min) were used to assess the flow behavior and processability of the materials in the molten state.

## Results and Discussion

### FTIR Analysis of Acrylamide-Functionalized Phenol-Formaldehyde (AF-PF)

The chemical structure of the synthesized AF-PF co-oligomer was characterized using Fourier-transform infrared (FTIR) spectroscopy. The IR spectrum (Fig. 1) exhibits several key absorption bands that confirm the presence of both phenolic and acrylamide-derived functional groups.

A broad and intense absorption band at 3423.12 cm<sup>-1</sup> is attributed to the stretching vibrations of –OH and N–H bonds, indicating the coexistence of hydroxyl and amide functionalities in the co-oligomer backbone [25–26]. This is characteristic of both the phenolic component and the acrylamide modification. Additionally, a weak band at 2092.81 cm<sup>-1</sup> corresponds to N–H bending, typically associated with the amide group [27].

The region near 1637.35 cm<sup>-1</sup> displays a strong peak related to the C = O stretching vibration of the amide group, in conjugation with the aromatic ring structure, confirming successful acrylamide incorporation [25]. Finally, a low-intensity band observed at 665.67 cm<sup>-1</sup> is assigned to the C–H deformation vibrations from the aromatic ring system of the phenol-formaldehyde matrix [27].

These spectral features collectively validate the structural modification of the phenol-formaldehyde oligomer with acrylamide units, which are expected to play a critical role in enhancing interfacial

interactions when used as a compatibilizer in LDPE/PP blends.

## Thermal Behaviour of AF-PF Co-Oligomer (TG/DT Analysis)

To ensure the thermal compatibility of the synthesized AF-PF co-oligomer with LDPE and PP during melt blending, thermogravimetric (TGA) and differential thermal analysis (DTA) were conducted. The objective was to verify whether the compatibilizer remains chemically and structurally stable under the extrusion processing temperature of 190°C.

As shown in the TG/DT thermogram (Fig. 2), a minor weight loss is observed around 93°C, which is attributed to the evaporation of physically adsorbed water and low-molecular-weight volatiles. This is a typical occurrence in many oligomeric systems and does not indicate structural degradation.

Three distinct mass-loss steps occur at approximately 342°C, 524°C, and 582°C, each corresponding to major stages in the thermal degradation of the co-oligomer. These multiple degradation steps reflect the chemically complex and crosslinked architecture of the AF-PF matrix. The first decomposition event (around 342°C) likely involves the breakdown of pendant functional groups such as acrylamide side chains and hydroxyl moieties. The subsequent events at higher temperatures are associated with the scission of the phenol-formaldehyde backbone and further carbonization processes.

The exothermic peak at 791°C, as detected in the DT curve, indicates the final thermal cracking of the carbon-rich residue, characteristic of highly crosslinked, aromatic-rich systems. The residual char yield at this point (~ 46%) confirms a high level of structural rigidity and carbon retention, which is typical of phenolic networks.

Most importantly, no significant weight loss or thermal event was detected below 300°C, thereby confirming that the AF-PF compatibilizer is thermally stable within the extrusion temperature range (~190°C). This ensures that the material retains its functional integrity during the blending process and can actively participate in interfacial reactions or interactions with the LDPE/PP phases, without premature degradation or volatilization.

Thus, the thermal analysis validates the AF-PF co-oligomer as a suitable and stable compatibilizer for polyolefin blend processing under conventional melt-compounding conditions.

## Physicochemical Properties of AF-PF Co-oligomer

The functionalization of phenol-formaldehyde (PF) oligomer with acrylamide significantly alters its physicochemical characteristics, enhancing its performance as a compatibilizer.

Table 1  
Key indicators of PF oligomer and AF-PF co-oligomer

| Indicators                     | PF Oligomer | AF-PF Co-Oligomer |
|--------------------------------|-------------|-------------------|
| Amount of free phenol, %       | 14.87       | 3–5               |
| Amount of free formaldehyde, % | 8.96        | 3.6–4.8           |
| Amount of hydroxyl groups, %   | 17.28       | 10.61             |
| Molecular mass                 | 450         | 960               |
| Density, kg/m <sup>3</sup>     | 1186        | 1250              |

As presented in Table 1, the AF-PF exhibits a notable reduction in the concentrations of free phenol and free formaldehyde when compared to the unmodified PF oligomer. Specifically, the free phenol content drops from 14.87% to a range of 3–5%, while the free formaldehyde content decreases from 8.96% to approximately 3.6–4.8%. This reduction is crucial for improving the environmental safety and stability of the material. Lower levels of unreacted monomers suggest fewer toxic residues, reduced risk of volatilization during processing, and enhanced suitability for applications requiring low emission and high safety standards.

In addition to improved toxicity metrics, the density of the AF-PF co-oligomer increases from 1186 to 1250 kg/m<sup>3</sup>, indicating the formation of a more compact, crosslinked structure. A higher density typically reflects better packing of polymer chains, which in turn contributes to greater thermal and mechanical stability – both essential properties for a compatibilizer used in melt-processing environments.

Moreover, the amount of hydroxyl groups decreases from 17.28% to 10.61% after acrylamide functionalization. This suggests that a portion of reactive hydroxyl functionalities in the original PF matrix are involved in the grafting of acrylamide units. The resulting increase in molecular weight and structural complexity likely accounts for the higher viscosity and improved film-forming behavior of the AF-PF material. These attributes are particularly advantageous in the context of polyolefin blend processing, where a stable, non-volatile, and interactive compatibilizer is required.

## Scanning Electron Microscopy (SEM) Analysis of Modified LDPE/PP Blends

To assess the impact of AF-PF compatibilizer on the microstructure and interfacial morphology of the LDPE/PP blend, scanning electron microscopy (SEM) was conducted on cryo-fractured surfaces of both unmodified and modified samples. The SEM analysis provides visual insight into the degree of phase separation and the quality of interfacial adhesion between LDPE and PP phases, which are critical parameters in evaluating blend compatibility and mechanical integrity.

The SEM images presented in Fig. 3 clearly illustrate the morphological differences between the unmodified and compatibilized LDPE/PP blends.

The low-magnification SEM images (Figs. 3a and 3b) clearly illustrate the morphological differences between the unmodified and compatibilized LDPE/PP blends. In the unmodified sample (Fig. 3a), the fracture surface appears rough and irregular, revealing weak interfacial adhesion and distinct phase separation between LDPE and PP. In contrast, the compatibilized sample (Fig. 3b) exhibits a smoother and more cohesive surface, with no visible phase boundaries, indicating enhanced interfacial interaction and improved miscibility due to the presence of the AF-PF compatibilizer.

The higher-magnification images (Figs. 3c and 3d) further reinforce these observations. The unmodified blend (Fig. 3c) shows a heterogeneous morphology with deep grooves and voids, typical of poor adhesion and brittle failure. Meanwhile, the compatibilized blend (Fig. 3d) displays a finer, more uniform structure with aligned fibrillar features and minimal voids, suggesting improved ductility and phase dispersion. These microstructural changes confirm the effectiveness of AF-PF in enhancing compatibility and mechanical integrity of the LDPE/PP blend.

(a)

Figure 3. Scanning electron microscopy (SEM) images of cryo-fractured LDPE/PP blends showing morphological differences between unmodified (a, c) and AF-PF compatibilized (b, d) samples at low (a, b) and high (c, d) magnifications.

## Differential Scanning Calorimetry (DSC) Analysis

Differential scanning calorimetry (DSC) was used to investigate the thermal transitions and crystallization behavior of both unmodified and modified LDPE/PP blends. The test involved a standard thermal cycle: an initial heating ramp, controlled cooling, and a second heating phase. This cycle enables a clear understanding of the melting and crystallization behavior of the polymer phases, as well as any changes induced by the compatibilizer.

The thermogram of the unmodified LDPE/PP blend (Fig. 4) reveals two distinct melting peaks during the second heating scan. The first peak, located around 110°C, corresponds to the melting of low-density polyethylene (LDPE), while the second, sharper peak near 165°C represents the melting point of polypropylene (PP). The presence of two clearly separated peaks indicates a lack of thermal interaction between the two polymers, confirming that the blend remains phase-separated and immiscible in the absence of a compatibilizer.

In contrast, the DSC curve of the modified blend (Fig. 5), which was compatibilized with AF-PF, shows more integrated thermal behavior. During the cooling stage, crystallization occurs between 120°C and 125°C, suggesting that the polymers begin to organize simultaneously. In the second heating cycle, a single dominant melting peak appears between 130°C and 140°C, indicating a shift toward more uniform melting behavior. This thermal response strongly implies that the AF-PF compatibilizer improved the compatibility between LDPE and PP, promoting co-crystallization or closer thermal interaction.

## TGA Analysis of LDPE/PP Blends

Thermogravimetric analysis (TGA) was carried out to evaluate the thermal degradation behavior and residual char formation of both unmodified and AF-PF-compatible LDPE/PP blends under a nitrogen atmosphere. The TGA curves (Fig. 6) demonstrate that all samples exhibit negligible weight loss up to approximately 380°C, indicating that the bulk of the polymer matrix remains thermally stable well above typical processing temperatures. Beyond this threshold, a rapid mass loss occurs between 380°C and 500°C, corresponding to the scission of the polyolefin backbone and volatilization of low-molecular-weight fragments.

Figure 6. Thermogravimetric (TGA) Curves LDPE/PP blends (Blend 1: LDPE/PP; blend 2: LDPE/PP + 2% AF-PF; blend 3: LDPE/PP + 4% AF-PF; blend 4: LDPE/PP + 6% AF-PF)

Notably, the amount of residual char at 750°C increases systematically with higher AF-PF loading (Fig. 7). The unmodified LDPE/PP blend (Blend 1) leaves only about 1.0 wt % char, whereas blends containing 2, 4, and 6 wt % AF-PF yield approximately 3.1, 5.0, and 7.9 wt % char, respectively. This trend reflects the formation of a more crosslinked, carbonaceous network in the presence of the phenolic compatibilizer, which enhances thermal resistance and promotes char retention.

To further investigate the origin of the char residue observed during thermogravimetric analysis, an additional ash content determination was performed using controlled stepwise combustion in a muffle furnace. The aim was to distinguish between residues originating from external contaminants, such as carbon black, and those formed due to the presence of the AF-PF compatibilizer itself.

Samples were initially heated to 500°C to remove all organic content through pyrolysis and oxidation. Following this, the materials were further combusted at 900°C to volatilize any carbon black or similar carbonaceous additives. The remaining ash content was then measured with high-precision gravimetric analysis.

As shown in Fig. 8, the measured carbon black content remained low across all formulations, which is consistent with expected values for typical post-consumer plastic waste. In contrast, the amount of compatibilizer-derived char increased with higher AF-PF content.

These findings confirm that the majority of the residual mass observed in TGA does not result from contamination, but rather from the aromatic and thermally stable structure of the AF-PF compatibilizer. This further supports its role in improving the thermal resistance of the LDPE/PP blend and its contribution to the formation of a crosslinked char layer during high-temperature exposure.

## Density Evaluation of LDPE/PP Blends

To investigate the structural compaction and phase interaction of the polymer blends, density measurements were performed using the Archimedes principle, with ethanol as the displacement medium. This method provides insight into the bulk integrity of the material, where higher density typically reflects better internal packing and fewer voids within the matrix.

As shown in Fig. 9, the modified LDPE/PP blends consistently exhibited higher density values compared to their unmodified counterparts. The unmodified (waste) blends showed densities ranging from 0.912 to 0.920 g/cm<sup>3</sup>, while the modified blends reached values between 0.926 and 0.932 g/cm<sup>3</sup>. This consistent increase across all tested samples indicates that the incorporation of AF-PF improved the phase interaction between the otherwise immiscible LDPE and PP components.

The enhanced density is attributed to better interfacial adhesion and reduced void formation, resulting from compatibilizer-induced cohesion at the molecular level. These findings complement the morphological and thermal data, confirming that the AF-PF compatibilizer not only promotes compatibility but also contributes to a denser and more structurally integrated blend.

## Melt Flow Rate (MFR) Analysis

Melt flow rate (MFR) testing was performed to assess the rheological behavior and processability of the LDPE/PP blends in the molten state. As shown in Fig. 13, a significant difference was observed between the unmodified and AF-PF-modified samples. The waste LDPE/PP blend exhibited an MFR of 3.5 g/10 min, indicating relatively low viscosity and ease of flow under applied load at 190°C.

In contrast, the modified blend, containing AF-PF, showed a much lower MFR value of 1.5 g/10 min under the same testing conditions. This reduction in MFR implies a higher melt viscosity, which can be attributed to enhanced interfacial interactions and network formation between the polymer phases in the presence of the compatibilizer. The increased viscosity suggests improved structural integrity and reduced molecular mobility, typically associated with better mechanical performance.

The decrease in MFR upon modification is consistent with the enhanced phase compatibility and reduced chain slippage due to the reactive interactions introduced by AF-PF. While the lower MFR may imply slightly more energy-intensive processing, it also reflects the formation of a more cohesive and better-structured blend suitable for high-performance applications.

## Conclusions

The results of this study clearly demonstrate that the incorporation of an acrylamide-functionalized phenol-formaldehyde (AF-PF) compatibilizer can substantially improve the compatibility and properties of LDPE/PP waste blends. By targeting one of the most persistent challenges in mixed polyolefin recycling -namely, the intrinsic immiscibility between polyethylene and polypropylene, the research offers a viable solution that bypasses the need for time-consuming and costly separation processes. Instead of treating mixed plastic waste as an unrecoverable stream, this method presents a pathway to transform it into a more useful, processable, and mechanically robust material.

Chemical analysis through FTIR confirmed the presence of acrylamide and phenolic functionalities in the synthesized compatibilizer, which are key to enabling chemical interactions with the polymer matrix. The observed thermal stability of AF-PF at temperatures above the processing threshold assures its viability during melt blending. The fact that no significant mass loss was detected before 300°C further

strengthens the case for its practical application in extrusion processes, where retention of functional groups is crucial for interfacial adhesion.

Morphological analysis using SEM provided visual evidence of the compatibilizer's effect. The transition from irregular, phase-separated structures in unmodified blends to smoother, more integrated morphologies in the AF-PF-modified systems was especially telling. These images make it clear that the compatibilizer improved the miscibility between LDPE and PP phases, which aligns well with both thermal and rheological data.

DSC measurements revealed a shift from two distinct melting peaks in the unmodified blend to a more unified melting profile after modification. This behavior points toward a degree of thermal interaction or co-crystallization facilitated by the compatibilizer. TGA results further support the structural reinforcement of the material, with the modified blends showing increased char residue.

Density measurements and melt flow rate (MFR) testing also confirmed the influence of AF-PF on the overall structure of the blend. Modified samples consistently showed higher density values, suggesting better phase packing and fewer interfacial voids. At the same time, the reduced MFR values reflected increased viscosity and improved interfacial strength. Although a lower MFR may imply slightly more resistance to flow during processing, it is a worthwhile trade-off when the goal is to produce stronger, more cohesive materials from waste.

Altogether, these findings indicate that the use of AF-PF as a compatibilizer is a promising route for enhancing the value and performance of mixed polyolefin waste. The improved thermal behavior, better morphology, enhanced mechanical resistance, and greater structural integration observed across the modified blends all point toward a material that is far more suitable for secondary use than its unmodified counterpart.

## Declarations

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### *Author Contributions*

The manuscript was written through contributions of all authors. All authors have given approval to the final version of the manuscript. CRediT: **Tamerlan Tayyar Shirinov**: Conceptualization, investigation, methodology, visualization, resources, writing - original draft; **Tamilla Muxtar Naibova**: Supervision, formal analysis, validation, data curation; **Christophe A. Serra**: Supervision, guidance, project administration, facilitation of collaboration with experts, and critical review of the manuscript. **Aytan Ali Mammadova**: Investigation, methodology, experimental synthesis; **Thibault Parpaite**: Supervision, resources, and critical review of the manuscript.

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### *Conflicts of Interest*

Not applicable

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# Figures

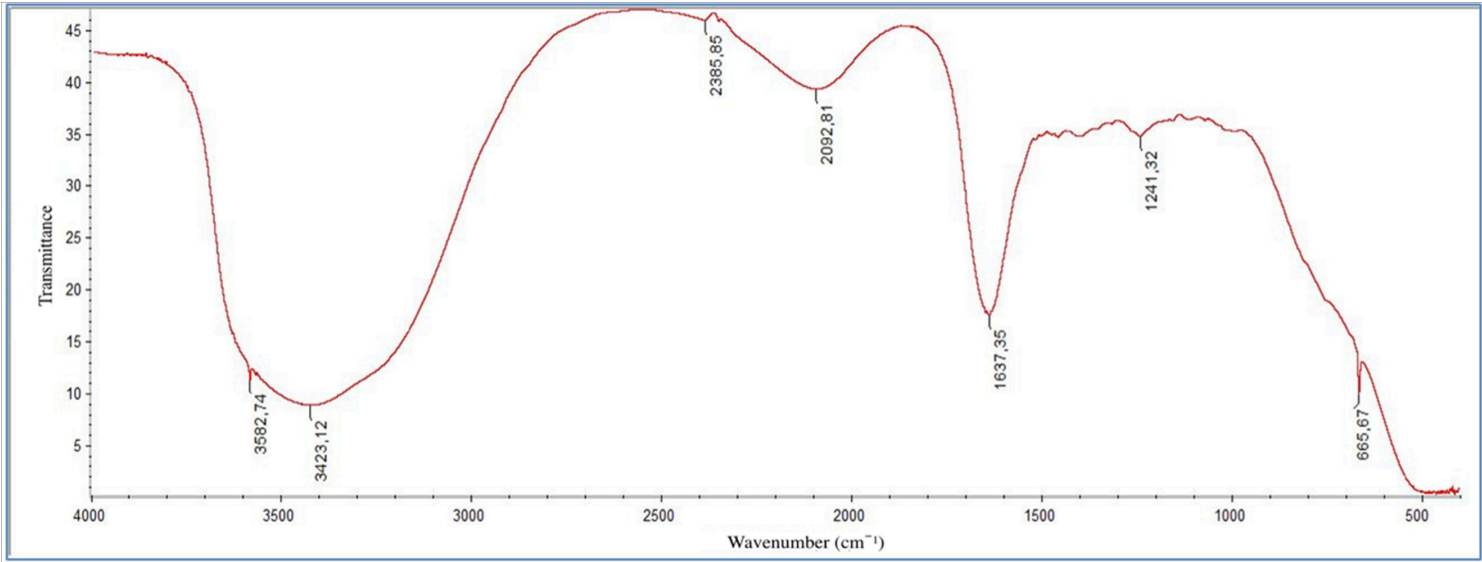


Figure 1

IR spectrum of functionalized phenol-formaldehyde co-oligomer.

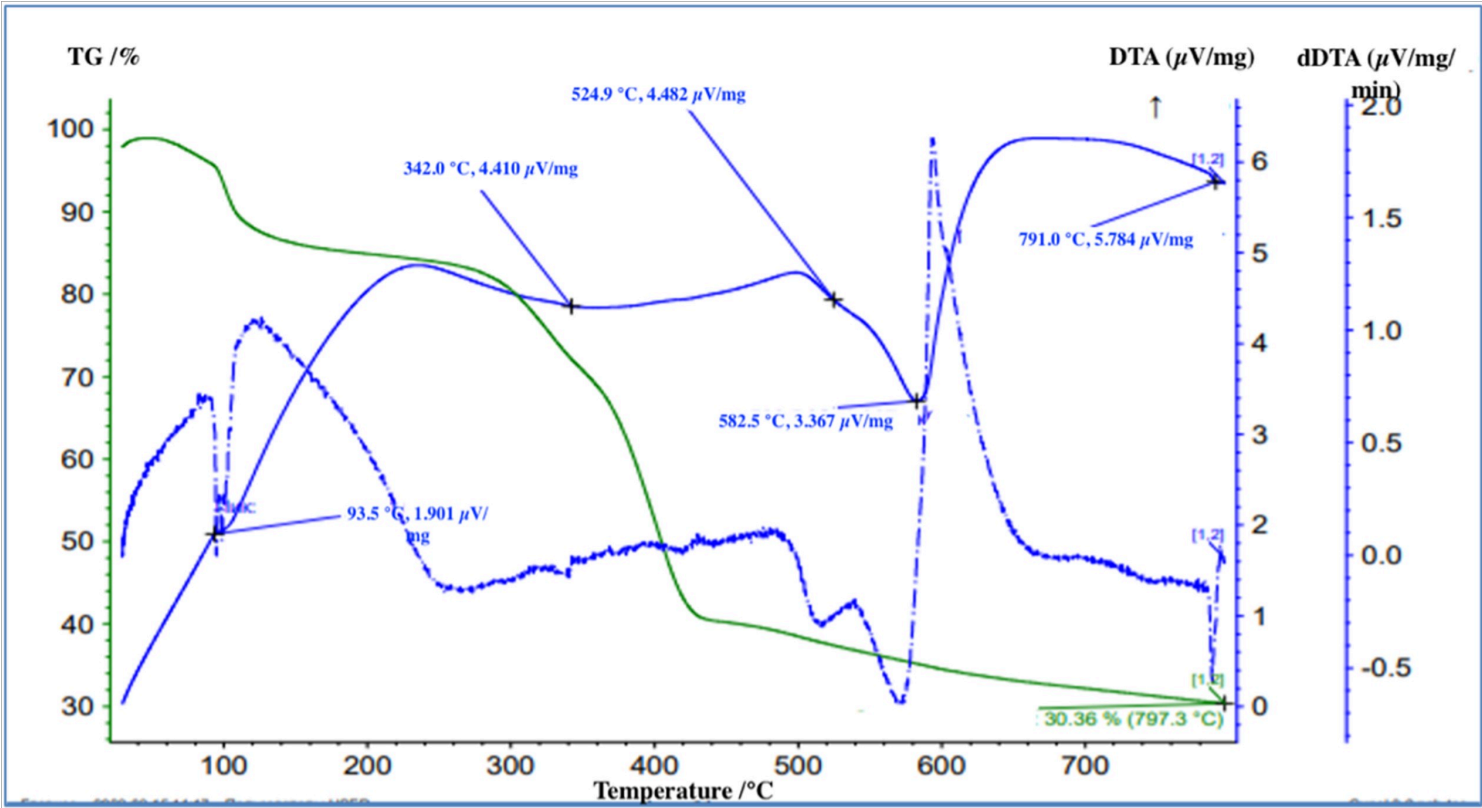


Figure 2

TG/DT curves of AF-PF co-oligomer

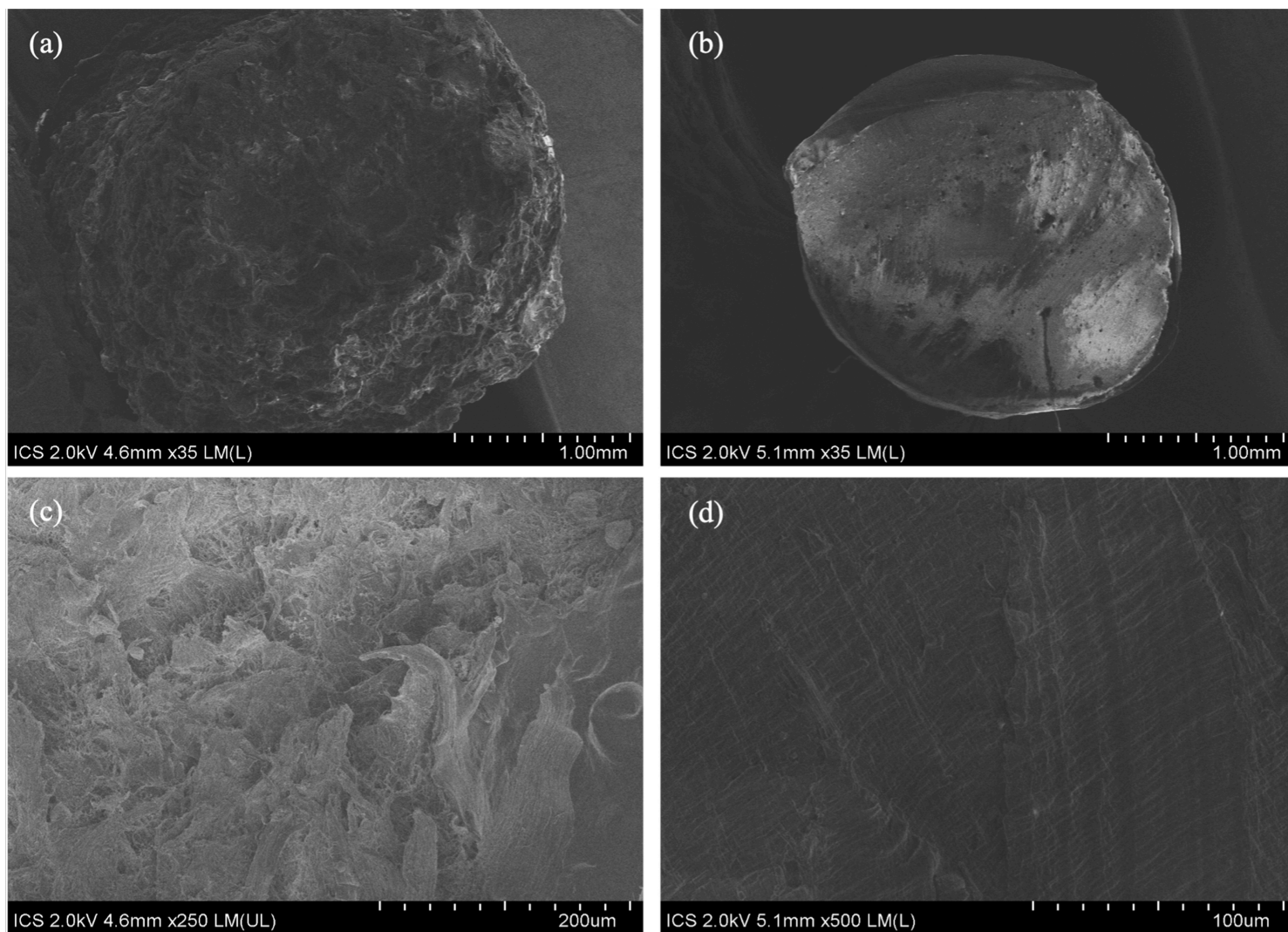


**Figure 3**

Scanning electron microscopy (SEM) images of cryo-fractured LDPE/PP blends showing morphological differences between unmodified (a, c) and AF-PF compatibilized (b, d) samples at low (a, b) and high (c, d) magnifications.

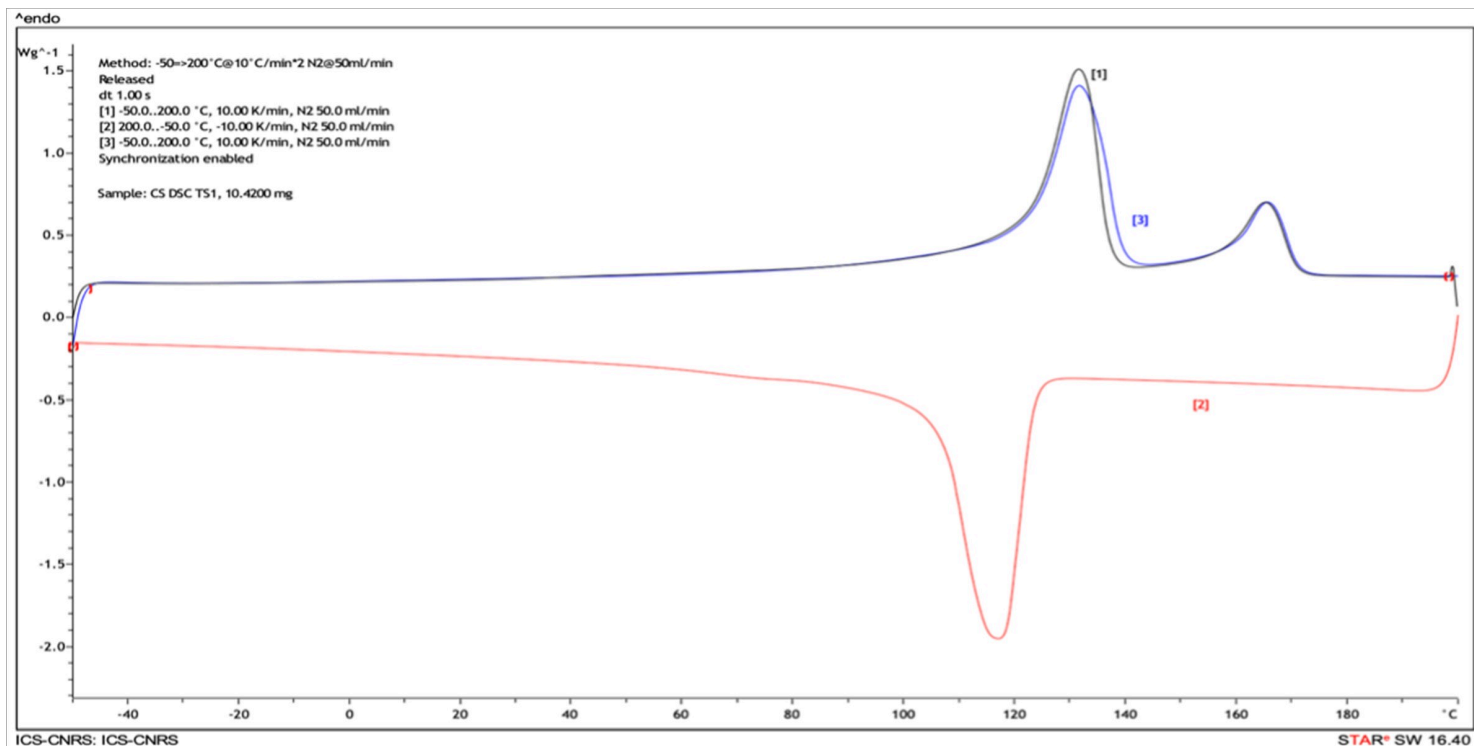


Figure 4

DSC thermogram of unmodified LDPE/PP blend

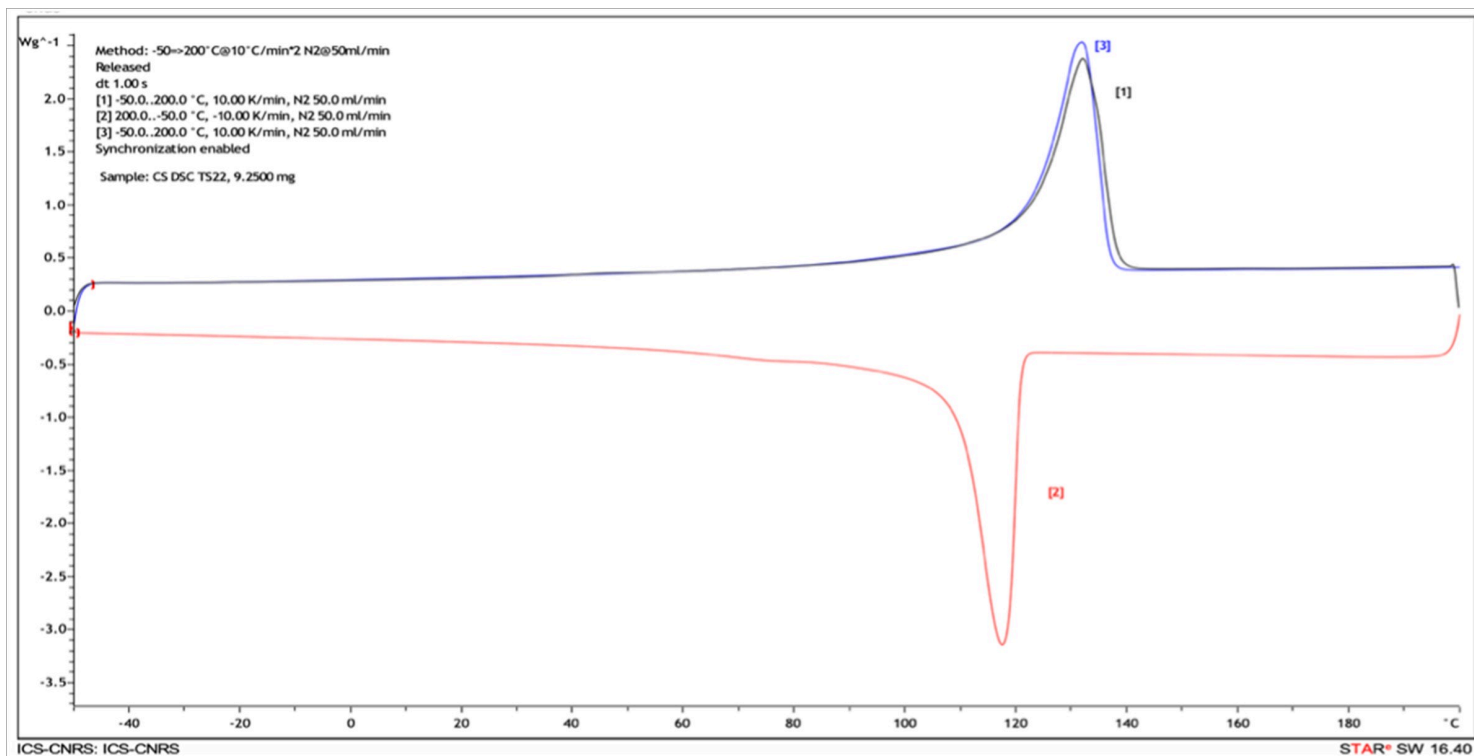


Figure 5

DSC thermogram of AF-PF modified LDPE/PP blend

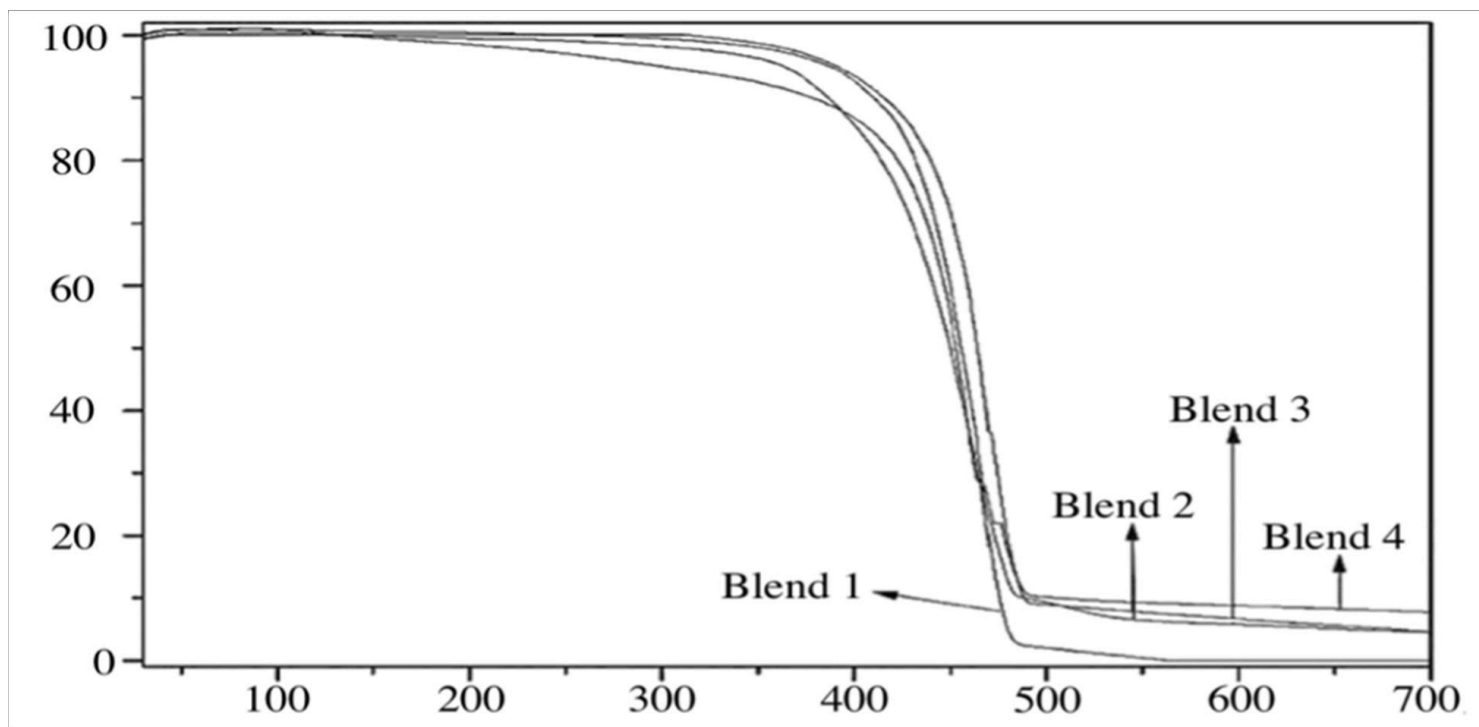


Figure 6

Thermogravimetric (TGA) Curves LDPE/PP blends (Blend 1: LDPE/PP; blend 2: LDPE/PP + 2% AF-PF; blend 3: LDPE/PP + 4% AF-PF; blend 4: LDPE/PP + 6% AF-PF)

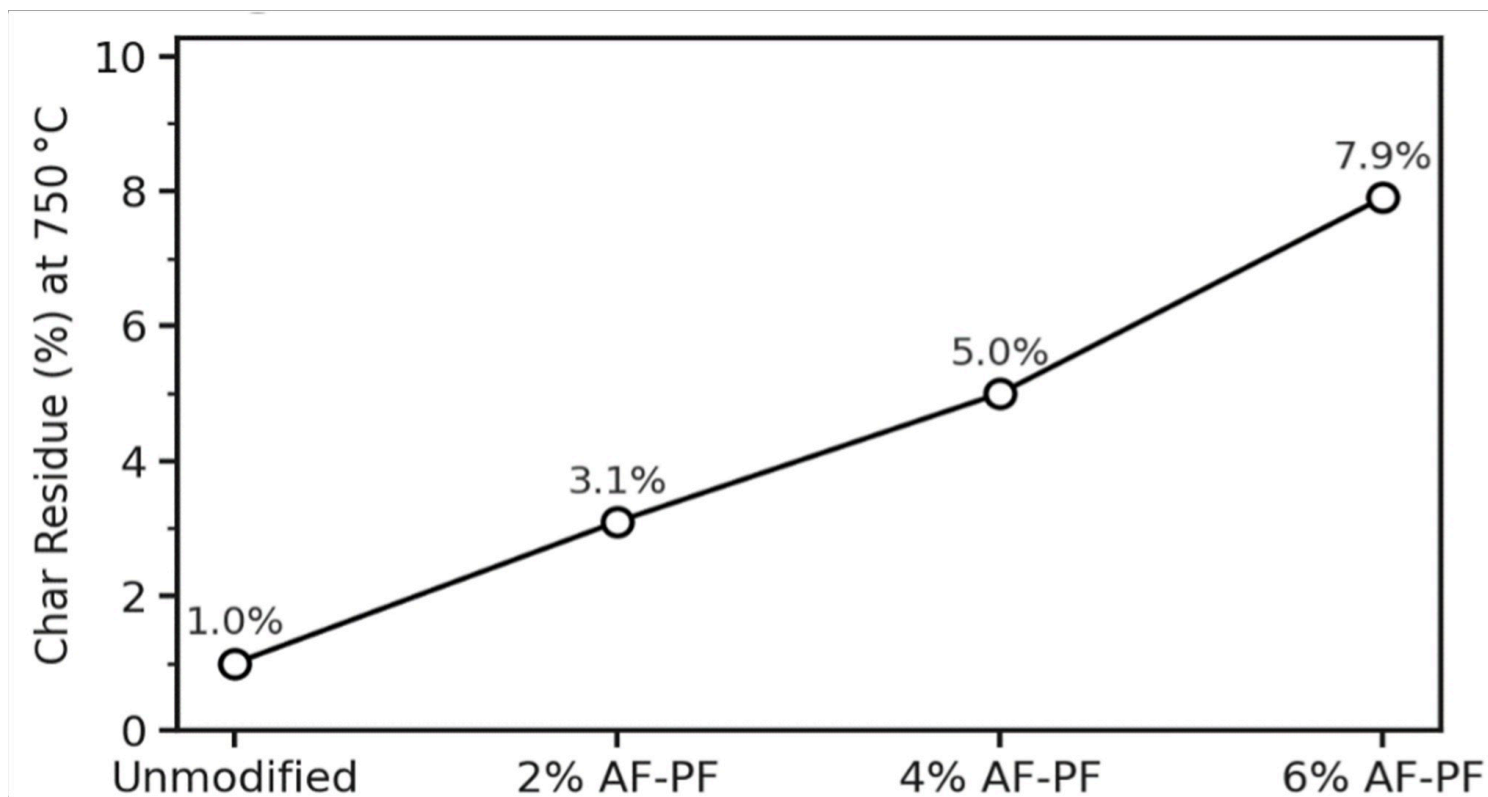


Figure 7

Char Residue Content of LDPE/PP Blends with Increasing AF-PF Compatibilizer Content

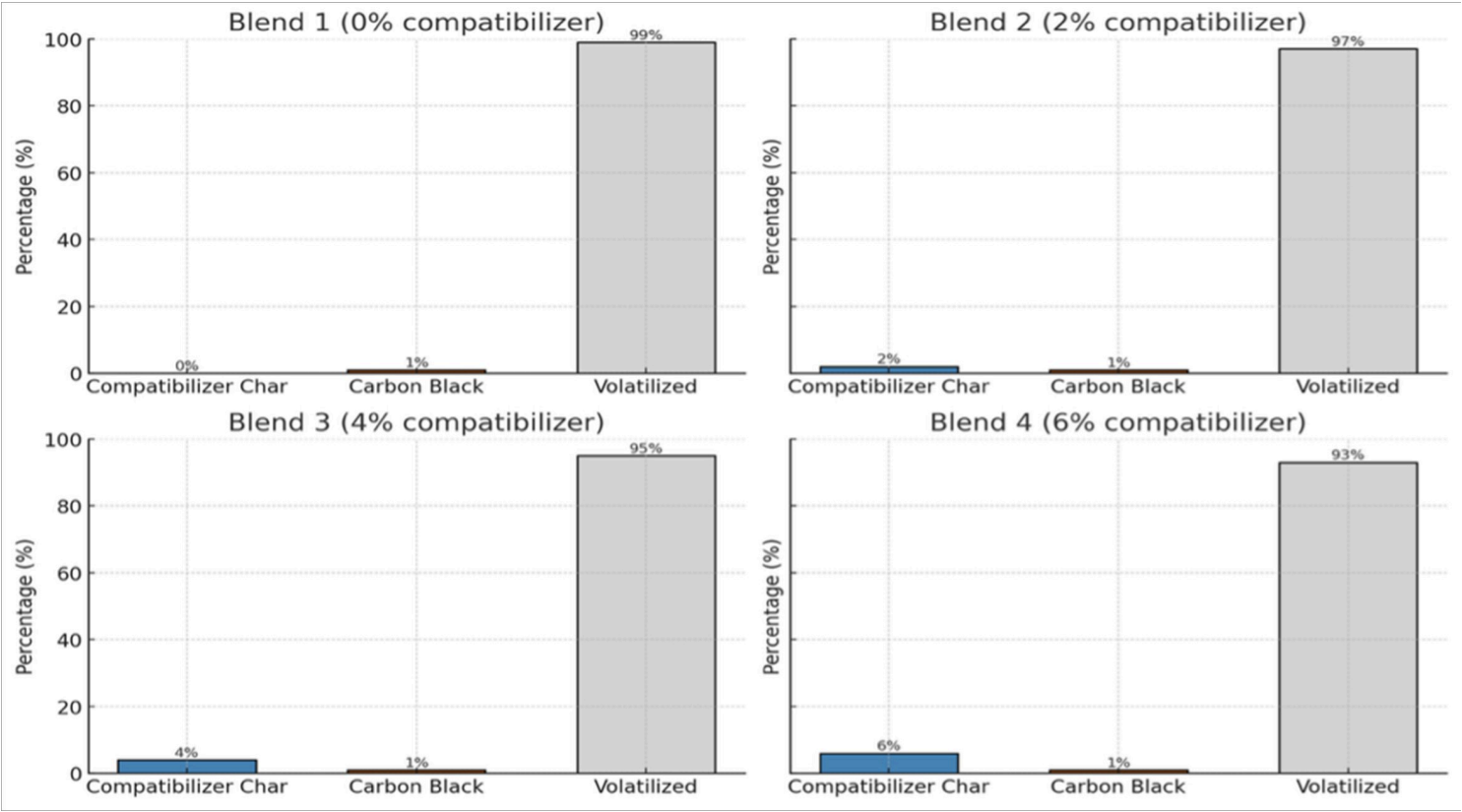


Figure 8

Decomposition Residue Composition in LDPE/PP Blends with Varying AF-PF Content (Blend 1: LDPE/PP; Blend 2: LDPE/PP + 2% AF-PF; Blend 3: LDPE/PP + 4% AF-PF; Blend 4: LDPE/PP + 6% AF-PF)

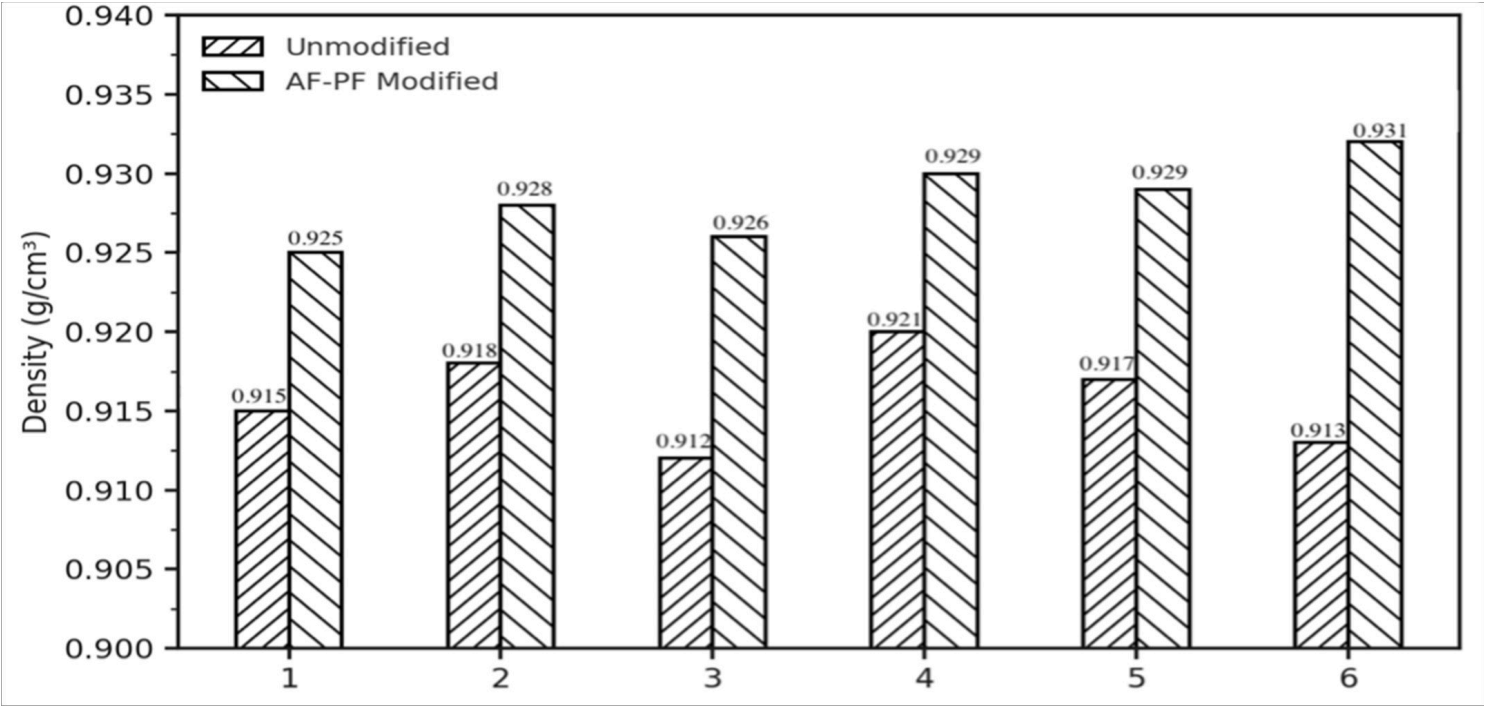


Figure 9

Comparison of Density Values Between Waste and AF-PF-Modified LDPE/PP Blends

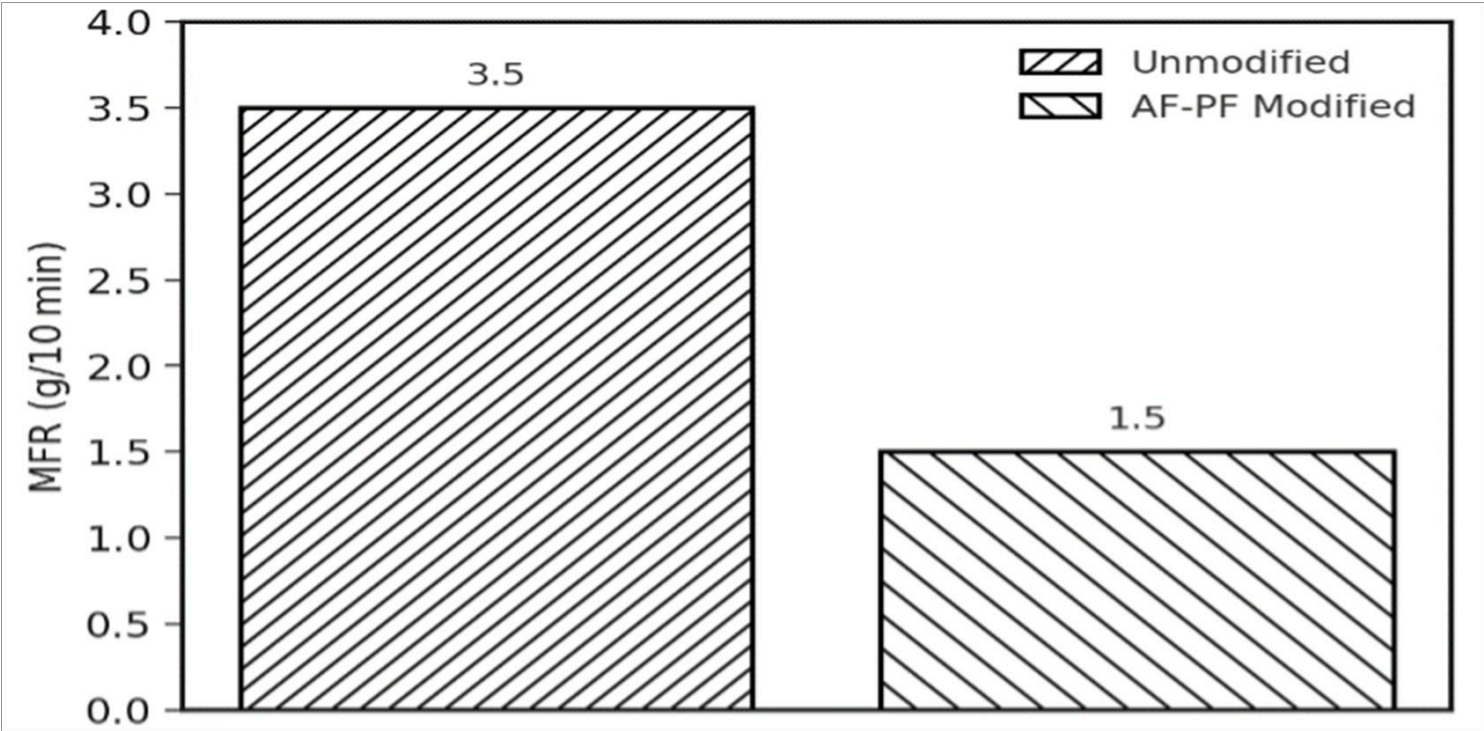


Figure 10

Effect of AF-PF Modification on Average Melt Flow Rate of LDPE/PP Blends