EuroSciCon

3rd Edition of International Conference and Exhibition on

Polymer Chemistry

March 26-28, 2018
Vienna, Austria

Polym Sci, Volume 4
DOI: 10.4172/2471-9935-C1-009

INFLUENCE OF ETHYLENE/PROPYLENE COPOLYMERS ON THE COMPATIBILIZATION OF POLYPROPYLENE CONTAMINANTS IN MIXED STREAM POST-CONSUMER HDPE

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Polyethylene is utilized throughout industrial, agricultural, and packaging applications. The current market is estimated to be $164 billion with a projected global demand growth of 4% through 2018. There are several state level regulations throughout the United States that mandate a minimum amount of post-consumer recycled polymer content in commodity goods to increase the long-term sustainability effort associated with polymer use (e.g., SB 270 in California). As a result, the demand for post-consumer feedstocks is expected to increase, which will necessitate a more widespread adoption of mixed-stream sources to ensure availability of resin supply. However, the current sorting practices and technology cannot sufficiently differentiate and isolate polyethylene from polypropylene. As a result, mixed stream post-consumer polyethylene feedstocks are commonly contaminated with polypropylene which creates immiscible polymer blends when melt mixed. Further, the presence of multiple phase-separated domains may detrimentally influence the polyethylene properties of certain applications which we hypothesize to be mitigated via compatibilization of the two phases. This work investigates the influence of ethylene/propylene copolymers on the physical properties of mixed-stream injection molding and blow molding grade high-density polyethylene post-consumer feedstocks contaminated with polypropylene. The post-consumer feedstock was extrusion melt blended with the ethylene/propylene copolymer and the resulting properties were investigated via differential scanning calorimetry, dynamic mechanical analysis, thermogravimetric analysis, and dart impact testing. Scanning electron microscopy was also utilized to investigate changes in the size of the immiscible domains. This work provides critical insight for converters and design engineers as the widespread use of mixed-stream post-consumer feedstocks in consumer and industrial applications increases.

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