Solvent-Based Recycling of Waste Plastics

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Abstract

Plastics provide many benefits to society. However, with plastic consumption comes plastic waste. Improper plastic waste management is a growing problem. Solvent-based purification (SBP) of waste plastics is one way to address this problem. This type of recycling method uses a selective solvent dissolution process to remove impurities from postindustrial and postconsumer plastic, thereby recovering plastics of suitable quality for reuse. The clean polymer can be recovered from the solution by precipitation. Plastics recycling via SBP is considered a physical recycling process rather than a chemical recycling process. There are several processes that have been developed based on solvent-based recycling of plastic waste. Proctor & Gamble's PureCycle™ Process uses a solvent dissolution process to recover virgin-like recycled polypropylene (PP). APK AG's Newcycling® Process recycles multilayer plastics to yield polymers with properties close to virgin materials. Fraunhofer's CreaSolv® Process selectively dissolves targeted polymer from plastic waste, removing contaminants, and precipitating the resulting polymer fraction. Polystyvert uses a solvent to dissolve waste polystyrene (PS), filtering out contaminants from the PS solution and then recrystallizing the polymer.

In this report, IHS Markit presents the industrial status and a technology review of solvent-based recycling of waste plastics. We present the process economics for

- The PureCycle™ Process for postconsumer PP waste
- A selective solvent dissolution-precipitation process for postconsumer PS foam demolition waste
- A selective solvent dissolution-precipitation process for postindustrial polyethylene/polyamide-6 (PE/PA-6) film waste

Contents

Tables

Figures

Appendix D Figures

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