

Abstract

Selective ABS Dissolution with Eutectic Solvents: Toward Greener Recycling [†]

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Acrylonitrile–butadiene–styrene (ABS) plastics, commonly found in electronics, automotive parts, and household items, continue to pose a substantial environmental challenge, with the majority still ending up in landfills or incinerators. Dissolution-based recycling methods have emerged as effective alternatives to conventional mechanical recycling, particularly for recovering high-quality fractions. This work explores the use of eutectic solvents (ESs) as renewable, low-impact alternatives for the selective dissolution and recovery of ABS components—specifically, the styrene–acrylonitrile (SAN) copolymer. A computational solvent screening of over 30,000 potential candidates was conducted using the Conductor-like Screening Model for Realistic Solvents (COSMO-RS), followed by experimental validation to assess the solubility of SAN in selected ESs. The solubility of SAN was assessed under mild conditions (60 °C, 1 h), and three ES systems were found to be effective, with recovery yields up to 70%. The recycled polymer and residues were characterized using Fourier-transform infrared spectroscopy (FTIR) and nuclear magnetic resonance (NMR) analyses. Notably, preliminary results suggest that effective dissolution is possible even at ambient temperature and pressure. These findings highlight the potential of ESs as sustainable and scalable solutions for the recovery of difficult-to-recycle polymeric waste such as ABS.

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