

Delamination Recycling of Multilayer Plastic Films

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Abstract:

Only a small fraction of the plastics produced are recycled, with the great majority landfilled or released into the environment. Mechanical recycling currently used to recycle plastic cannot handle films which constitute about 40% of all plastic packaging. Polyolefin-rich films are suitable feedstock for pyrolysis, however pyrolysis breaks down the polymer chains to produce hydrocarbons that are typically used as fuel, which does not constitute true recycling. Research in our group advances molecular recycling, whereby polymers are separated and recovered through selective interactions with solvent. Because the polymer chains do not break and retain their embodied energy, this is a promising, low-energy, low-greenhouse gas (GHG) plastics recycling methodology.

This project addresses the recycling of multilayer films which comprise multiple layers of polymer combined into a single film to meet consumer specifications such as preserving food and medicine, acting as oxygen or moisture barrier, and keeping products sterile. This presentation highlights the solvent-assisted delamination process that we have developed, which recovers from multilayer films the majority component polyethylene in the solid form, hence greatly reducing solvent amounts and the corresponding energy needs and GHG emissions compared to dissolution-precipitation recycling. Delamination recycling presents an energy efficient and environment-friendly approach to recover value from the ~17 million metric tons of multilayer plastic films that are produced every year globally.

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