

Experimental Validation of Viscosity Homogenization Treatment System for Waste Plastic Recycling

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ABSTRACT

Waste plastics are often a mixture of plastics in various states depending on the recycling process, which consists of sorting, washing, drying, and melt-blending, and making them into pellets¹. Waste plastics are known to have reduced mechanical properties², and recycled plastics are often used by blending with virgin plastics. In molding processes, high-precision moldings in extrusion molding and injection molding rely on the uniformity of the flow characteristics of the plastics. Therefore, it is required that the viscosity is uniform even in the recycled pellets of waste plastic.

In this research, we developed the Viscosity Homogenization Treatment System³ of waste plastic recycling and verified it experimentally. The system consists of two extruders, the lab-made in-line viscometer, and a control PC. To general verification, virgin plastics (polypropylene, PP) with different flow curves were used. For the target viscosity of the recycled plastic was reached, the volume fraction of the two virgin resins used as adjusting agents was controlled considering the transient viscosity change of PP measured by an in-line viscometer. Then melt-blending was carried out using a second extruder. As a result, the viscosity of the obtained recycled plastic agreed well with the target viscosity, demonstrating the system's effectiveness.

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