Recyclability of Virgin and Recycled Compounds for Mobility Applications

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The mechanical recycling of polypropylene is usually done by milling post-consumer goods followed by extrusion and pelletisation. Multiple cycles, longer exposure to high temperatures and intensive shearing may give rise to thermal, thermo-oxidative or mechanical degradation. Thus, it is essential to enlarge the knowledge about recyclability of PP and PP-based compounds.

In this study, a systematic assessment of the recyclability of a polypropylene (PP) based compound, containing 30 wt.-% mechanically recycled polypropylene from rigid packaging was carried out. For the sake of comparison, a virgin PP-based composition was analyzed as well. To simulate the effect of multiple processing in the recycling process, the materials were sent five times over a twin screw extruder. After selected runs the material properties were characterized.

The main properties influenced after multiple extrusion of the virgin compound and the recycled compound (30 wt.-% post-consumer recyclate, PCR) were flexural modulus, deformation behaviour during instrumented puncture test at -30°C, and emissions. OCS (optical control systems) analysis demonstrated reduction of inhomogeneities after each extrusion step for the virgin and the PCR-compound. Thermoanalytical and rheological measurement did not show any traces of degradation. Apparently, each compounding step only improved the talc dispersion and reduced the emissions which impacted the relevant properties positively. The fact that especially puncture resistance improved significantly for the virgin compound pointed at improvement potential for the respective production.

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