Thermoplastic Polyolefins based on High Crystallinity Polypropylene(HCPP)

윤 이 근, 김 병 규
부산대학교 고분자 공학과

Although polypropylene(PP) has well-balanced physical properties and easy processability, it needs improvement in impact toughness especially at low temperature and flexibility. For this reason, PP has long been blended with elastomeric polyolefins, typically with EPR (ethylene-propylene rubber) and EPDM(ethylene-propylene diene monomer). High crystallinity polypropylene(HCPP) has higher intermolecular crytallinity and high isotacticity in every polymer chain, especially longer molecular chain, to give a highly crytallized solid of high uniformity by formation of numerous small-sized spherulites.

Recently it has also been claimed that PP crystalline lamellas can be dispersed in a matrix consisting of networked amorphous PP and EPR, where EPRs are elongated to form fibrils along the flow direction during injection. The domain morphology is closely related to the properties and it should depend on several factors including blend composition, viscosity ratio of rubber to PP, and interfacial conditions.

We consider HCPP blends with rubbers having different viscosity leading to different viscosity ratio of rubber to PP. The effects of addition of talc, high density polyethylene(HDPE), and linear low density polyethylene(LLDPE) were also studied in terms of morphology, rheology, thermal, mechanical properties of the blends.

Melt blending was done using corotating twin screw extruder with L/d=30 at 30rpm, 210℃. Before mixing HCPP with rubbers, masterpellet of talc and HCPP were prepared to increase the viscosity of HCPP to reduce viscosity ratio of rubber to HCPP. And extrudates were injection molded at the same condition as extrusion.

Regarding the effect of rubber type on the mechanical properties of HCPP/rubber blends, rubbery PE copolymer with α-olefin gave better tensile modulus, flexural modulus and strength, and impact strength as compared to EPR. This is mainly due to the finer dispersion of rubbery PE copolymer with α-olefin in HCPP matrix. And samples that show fibrillation of skin layer in the blends are superior to samples in impact strength that show droplet morphology.