Improvement of failure behavior of iPP by addition of polypropylene-carbonate.

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In this work, we investigated the addition effects of rubbery polypropylene carbonate (PPC) on the tensile properties of isotactic polypropylene (iPP). The PPC materials produced from the CO2 gas were used in this study. Accoding to electron microscopy and optical microscopy, the PPC domains, the size of which is about a few micron, homogeneously disppersed in the iPP matrix, resulting in that the additon of PPC showed a higher strength under higher tensile speeds above 80 mm/min. The iPP sample shows more brittle above 80 mm/min and the elongation at beak is drastically reduced, resulting in that the stress at beak point, i.e. strength, is markedly reduced. However, for iPP/PPC blends the ultimate values such as elongation at break as well as the stress at break were found to be independent of the elongation speed. Thus, at higher elongaiton speeds abobe 80 mm/min, the iPP/PPC blends showed a high drawability keeping a high stress level. The failure mechanism under higher elongation speeds is much different between iPP and iPP/PPC: iPP showed a more brittle fashion and iPP/PPC blend showed a more ductile fashion.

In order to examine the structural origin for high drawability of iPP/PPC at higher elongation speeds, we measured the electron and optical microscopy of the specimens damaged under tensile tests. It is very interesting to note that the craze-like voids appers along the stretching direction for pure iPP whereas the addtion of PPC caused craze-like voids running prependicular to the stretching direction.