

Improvement of mechanical properties of ABS/PLA composites

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Replacement of part of ABS with PLA may reduce the consumption of petroleum-based resources and thereby enhance the eco-friendliness of the material. However, the incompatibility between PLA and ABS as well as the brittleness of PLA makes difficult to achieve the desired material properties. It is certain that a complete prevention of the deterioration of the material properties of ABS as a result of the incorporation of PLA is unavoidable. However, since the material properties of ABS are far superior to those required for many car interior parts, ABS/PLA composites can be used for the same purpose instead of ABS alone, if the material properties meet the target values.

ABS50/PLA50 composites were prepared in order to raise the content of renewable substance in the ABS-based automobile interior parts. Incorporation of PLA into ABS deteriorated the mechanical properties of ABS significantly as was expected.

However, incorporation of G-ABS enhanced the impact strength of ABS/PLA composites astonishingly. The mechanical properties of the ABS/PLA composites were further improved by the addition of SAN-GMA, which was more effective than either PC, PE-epoxy, EPR-MAH or SAN-MAH. The ABS50/PLA50 added with G-ABS and 5phr of SAN-GMA exhibited the tensile and impact strength higher than 40 MPa and 80 J/m, respectively, the target values to be applied for the car console boxes.

Incorporation of Songsorb in the range of 0.0~1.0 phr did not affect the tensile strength, flexural strength and flexural modulus, but raised the impact strength significantly. Songsorb contributed especially to the stabilization of PLA during the compounding process. Addition of Songsorb during the compounding process increased the activation energy of the thermal degradation of the ABS/PLA composites. It minimized the decrease in the molecular weight of PLA and reduced the production of volatile low molecular weight substances which should cause the formation of the void interstices between the dispersed phase and the matrix of the composites.

The improved mechanical properties of the ABS(BD28)50/PLA50 composites were attributed to the compatibilization effect of G-ABS and to the thermal stabilization effect of Songsorb toward PLA.

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