

Bio-based Plastics

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Abstract

In recent years, various environmental problems have developed on a global scale, such as environmental damage resulting from the destruction of the ozone layer and air pollution, and an increase in industrial and poisonous waste. In addition, the pace of global warming is rapidly increasing with increased CO₂ output from the burning of fossil fuels such as oil and coal, emphasizing the urgent need to reduce CO₂ levels. Under such circumstances, attention is turning toward more environmentally friendly bio-based materials.

At Fujitsu, we have researched how to use bio-based materials for battery covers and housings of portable word processors since 1996. In 2000, a Poly-lactic Acid (PLA) based material was adopted for disposable LSI carrier tapes. PLA is produced from chemical synthesis using a fermentation process of biomass stored in plants through photosynthesis (the base plant material is the starch in potatoes and so on). PLA, a material with a low environmental impact, does not release toxic gases when burned, and as a plant-based material has low manufacturing energy requirements. In other words, little fossil fuel is consumed in its production. From June 2002, smaller case parts for notebook computers were made from an optimized composite material based on PLA. In order to further expand the uses for PLA in notebook computer cases, the material must be rendered highly resistant to flames and heat. In addition, because the glass-transition temperature for PLA is low, it is not easily molded, thus limiting the mass production efficiency. By combining polymer-alloy and flame retarding technologies, Fujitsu has developed a bio-based plastic suitable for use with notebook computers.

Technology

- Heat resistance and molding properties have been improved by configuring PLA as a polymer-alloy with a solubility parameter similar to PC (poly-carbonate) (Figure 1).
- By forming a carbonized coating through efficient burning, fire retardant properties exceeding UL94 standards have been achieved without the use of halogen fire retardants.

Application Examples

A world first, a large size plastic housing made of environmentally friendly bio-based plastic has been developed and used for the Spring 2005 "FMV-BIBLO NB80K" notebook computer (Figure 2). In notebook computer housing applications, CO₂ emissions over the complete lifecycle can be reduced by approximately 15% when compared to traditional petroleum-based plastics.

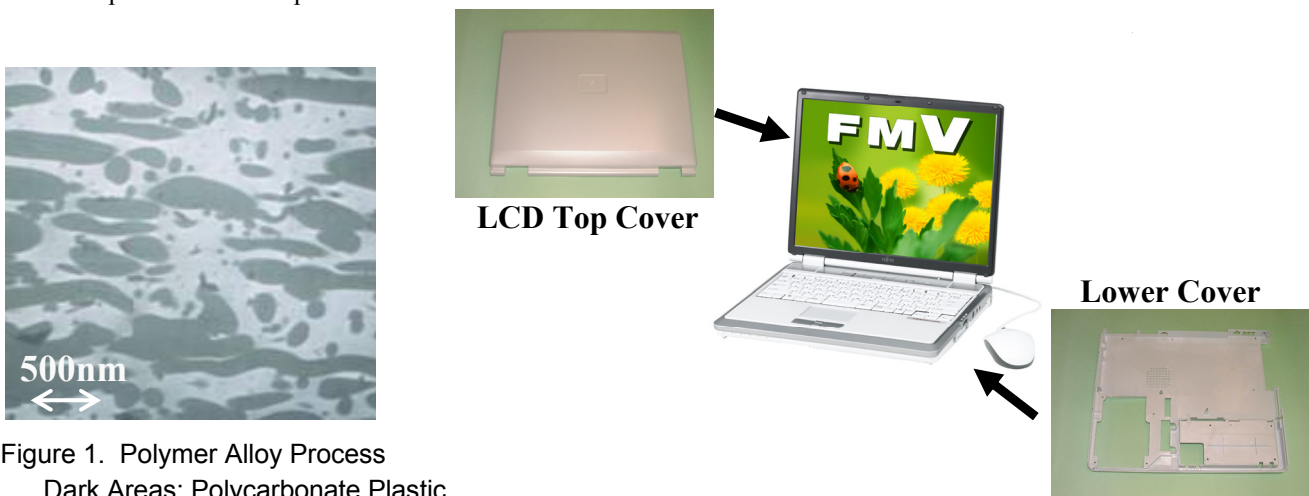


Figure 1. Polymer Alloy Process
Dark Areas: Polycarbonate Plastic
Light Areas: Poly-lactic Acid

Figure 2. FMV-BIBLO NB80K