

October 23, 2007

To our customers



SEKISUI PLASTICS CO., LTD.

Success in developing the foamed plastics by beads method-employed plant-derived resin, with a dimensional stability under 150°C

<<Summary>>

◇ Sekisui Plastics Co., Ltd. has successfully developed the world's first foamed plastics by beads method*1—employed high-crystalline poly-lactic acid (PLA) resin, with a dimensional stability under 150°C.

[Introduction]

Presently, Sekisui Plastics Co., Ltd. is promoting a three-year mid-range management plan "DASH50-Stage II" that targets the improvement and growth of profit structure. The following are given as important theme:

1. Innovation of the foamed plastic business
2. Expansion of the high-function material business

The whole company has been making an approach for the theme, to be solved, in union. On this occasion, Sekisui has successfully developed the world's first foamed plastics by beads method-employed high-crystalline PLA resin, with a dimensional stability under 150°C. as a material linked to the innovation of the foamed plastic business.

[Background]

● PLA resin, produced from a plant such as corn, can be recycled as resources or has carbon neutral characteristics*2. Therefore, it has been attracting considerable public attention as a material with a low environmental load. PLA resin has also been partially used as an electronic equipment chassis, film, and fiber.

*1: The plastics foamed by a beads method is a resin expanded body obtained when beads-shaped expanded resin beads (expanded beads) are molded by in-die expandable molding.

*2: Carbon neutral characteristics exert no influence on the increase and decrease of carbonic acid gas. For example, a tree generates carbon dioxide when burned. However, the carbonic acid gas in the air does not increase in the whole life cycle because a tree absorbs carbonic acid gas during its growth process via photosynthesis. The overall incoming and outgoing carbonic acid gas is thus judged to balance to zero.

● However, conventional PLA foamed plastics, especially PLA plastics foamed by a beads method, is deformed when 60°C is exceeded, and this remarkable deficiency in heating dimensional stability compared to other foamed plastics by beads methods [EPS (expandable polystyrene) and EPP (expandable polypropylene)] means it is not so widely used.

● The crystallinity of poly-lactic acid resin must be improved to enhance the heating dimensional stability of the PLA foamed plastics by a beads method. However, heat resistance rises as crystallinity is improved, making it difficult to perform molding. In the conventional production process, it was considered difficult to obtain the PLA foamed plastics by a beads method, with excellent heating dimensional stability.

[The PLA foamed plastics by beads method developed by our company]

- The PLA foamed plastics by a beads method developed by our company shows a remarkably superior heating dimensional stability compared to conventional PLA foamed plastics by a beads method. The dimensions hardly change, even right up to 150°C. This dimensional stability during heating is superior to EPS or EPP as well as the conventional PLA foamed plastics by a beads method.
In addition to the heating dimensional stability, the environmental suitability, mechanical strength, solvent resistance, and weather resistance boasted by PLA resin from the start are also maintained as excellent characteristics of PLA foamed plastics by a beads method.
- In developing PLA plastics, foamed by a beads method, with excellent heating dimensional stability, our company fully reviewed the production process of conventional foamed plastics by a beads method and suppressed the crystallinity of high-crystalline PLA resin to a low level in the uniquely developed production process during molding so as to facilitate molding and develop the technology to improve crystallinity during the final product stage.
- Through the epoch-making production process on this occasion, the heating dimensional stability of PLA foamed plastics by a beads method was shown to improve remarkably and PLA foamed plastics by a beads method with excellent mechanical strength could be successfully developed as a world first.

[Features of our PLA foamed plastics by beads method]

Our PLA foamed plastics by a beads method that succeeded in development this time has lightweight, thermal insulation, shock absorption, and resource saving characteristics that are the features of a foamed plastics. Moreover, heating dimensional stability is remarkably improved as well as excellent characteristics that poly-lactic acid resin has from the beginning.

- (1) **Excellent heating dimensional stability: Our PLA foamed plastics by beads method with a six fold expansion ratio, hardly changes in dimensions even at 150°C.**
- (2) **Excellent oil resistance: Appearance hardly changes, even during immersion in kerosene**
- (3) **Excellent weather resistance: Discoloration hardly occurs during an accelerated weathering test (for 200 hours).**
- (4) **Excellent compressive physical properties: High compressive strength and compressive elastic modulus are provided.**
- (5) **Coloring can be done easily and brilliant color beads can be obtained.**
- (6) **Volatile organic compounds (VOC) are hardly generated.**
- (7) **Excellent moldability and capable of being molded into various shapes.**

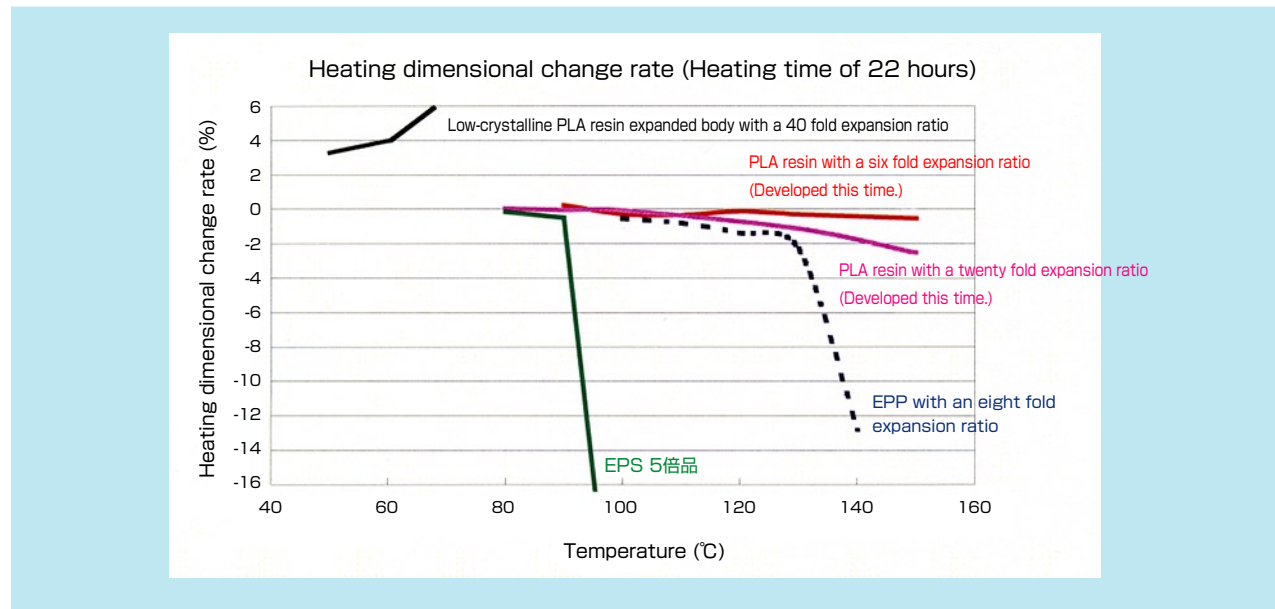
[Specifications of our PLA foamed plastics by beads method]

The expansion ratio of our PLA foamed plastics by a beads method successfully developed on this occasion is 6 to 20 times. The typical specifications are shown in the table below.

	Density (kg/m ³)	Expansion ratio (Times)	Thickness (mm)
Article with a six fold expansion ratio of 6 times	200	6	10~30
Article with a 20 fold expansion ratio of 20 times	60	20	10~30

[Heating dimensional stability of our PLA foamed plastics by beads method]

Our PLA foamed plastics by a beads method (article with a six fold expansion ratio) developed on this occasion maintains stable dimensions, even at 150°C, and has a heating dimensional stability superior to that of EPS or EPP as well as conventional PLA foamed plastics by a beads method.



[Expanded application]

This product can basically be used in EPS and EPP application fields. However, we want to expand this product to fields utilizing the features of high-crystalline PLA resin, namely, those suitable for heat resistance and environmental adaptability.

- (1) Transportation equipment-related items (Automobile parts, etc.)
- (2) Food packaging materials-related items (Design box for gift)
- (3) Toys (Building blocks and educational materials, etc.)
- (4) Leisure-related items (Helmet core materials, etc.)
- (5) Industrial material-related items (Heat insulation materials for high temperatures, etc.)
- (6) Construction material-related items (Decorative form, etc.)

[Future business plan]

Currently, Our PLA foamed plastics by a beads method has been studied and developed with Central R&D Laboratory in the core. In future, market and technology developments will be promoted according to company-wide cross development projects.

Moreover, the business plan below is prearranged for real commercialization.

- ・Using the existing pilot plant (with a production capability of 120 tons per year), market evaluation and test sales are carried out to promote market development.
- ・The introduction of a new plant (with a production capability of 600 tons per year) is investigated while checking the situation of market development.

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