Superhigh performance bioplastics having

deformable rigid backbones

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**Figure 1**. Typical structure of bio-based polyimide prepared from microbiual aromatic amino acid

Demand of high performance bio-based polymers has increased due to their excellent thermal, high chemical, good mechanical properties and environmental concerns. Conventional bio-based polymers have been derived from aliphatic polyesters and then the performances were very low and no remarkable functions were shown1. On the other hand, bio-based aromatic polyimides or polyamides cover one of the most vital classes of high performance polymers to be suitable for using as super-engineering plastics. Nevertheless, an aromatic diamine as one of the monomers has never been derived from microbes due to their incompatibility with microorganisms.2,3

Here we focused on bio-based super-engineering plastics of polyimides and polyamides derived from bioavailable aromatic diamines, which were photodimers of 4-aminocinnamic acid (4ACA) available from genetically-engineered *Escherichia coli*, and tetraacid. These polymers were processed into transparent films having high heat resistance (*T*g > 270 oC, *T*d10 : ca. 400 oC), owing to rigid backbones. Some of polyamides showed superhigh mechanical strength over 400 MPa keeping good transparency, and high strain energy density over 200 MJ/m3, based on the deformability of cyclobutanyl moiety. Low density was provided in the range of 1.18-1.38 g/cm3. Then the presence bio-plastics can hopefully contribute to the sustainable society establishment where high-performance and light-weight materials should be utilized.

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**References**

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