# Over 390 °C, Bioplastics with the Highest Thermoresistance Temperature

***A way to low price polyimides for metal-alternation***

Nomi, Japan- Prof. Tatsuo Kaneko at the Japan Advanced Institute of Science and Technology and Prof. Naoki Takaya at the University of Tsukuba have developed the novel bio-based polyimides with the highest thermoresistance temperature of all the reported bioplastics by way of photochemistry of cinnamoyl products from genetically-manipulated microorganisms. The study, which was published in the online ASAP cite of (ACS Journal Publications, *Macromolecules*) on February 18, 2014, is expected to contribute to the promotion of weight saving of automobiles and towards the development of a sustainable low-carbon society.

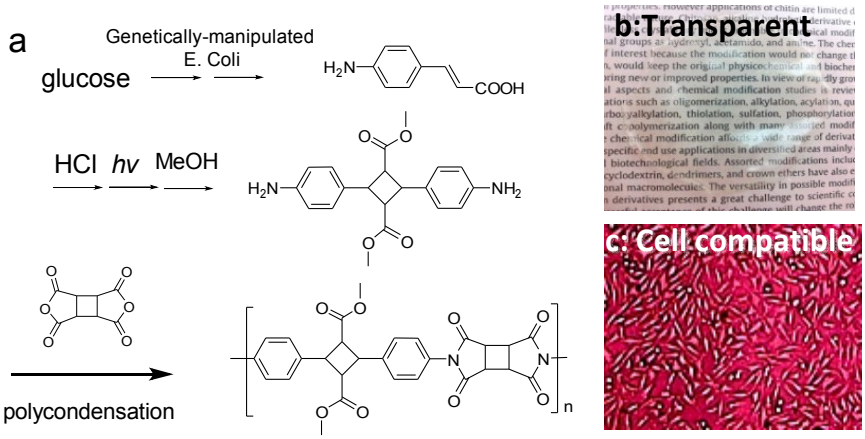


Figure. a) Synthetic route of biopolyimides, b) Biopolyimide film with high transparency, and c) L929 fibroblasts extending well on biopolyimide films.

The development of high-performance bio-based plastics such as polyimides (PIs) is indispensable to establish a sustainable green society, but is very difficult due to the incompatibility of their monomeric aromatic diamines with microorganisms. Here, we developed bio-based PIs from bioavailable aromatic diamines, which were photodimers of cinnamon-related molecules derived from genetically-manipulated *Escherichia coli*. These bio-based PI films showed ultrahigh thermal resistance over the melting temperature of lead-free solders, which is the highest value of all bio-based plastics reported thus far. The PI films also showed high tensile strength, high Young's moduli, good cell compatibility, excellent transparency, and high refractive indices, which is expected metal-alternation in automobile materials to save its weight, leading to drastic reduction of $CO_2$ emission by transportation. Prof. Kaneko and Prof. Takaya made additional calculation for materialization; the price of the biopolyimide film (density: 1.2 g/cm$^3$) is expected around 30 USD/kg which is similar to food additives and is lower than the toughened glass (density: 2.5 g/cm$^3$) of automobiles, $CO_2$ reduction degree in the world will be 100 Mt per year which is much higher than aimed values of individual countries, and market size is 70 million USD which is large enough to be operated by a big company.

Researcher Information
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Journal Information
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