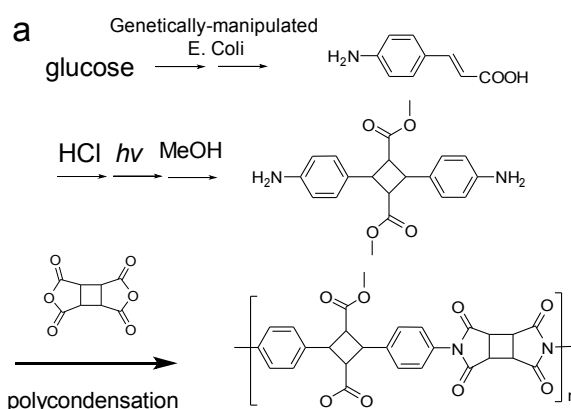


Over 390 °C, Bioplastics with the Highest Thermoresistance Temperature

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



b: Transparent

...properties, however applications of chitin are limited d... alternative... chemical modifi... tal groups as hydroxyl, amino, and amine. The cher... if interest because the modification would not change it... would keep the original physico-chemical and bioc... ring new or improved properties. In view of rapidly gro... if aspects and chemical modification studies is rev... ations such as oligomerization, alkylation, acylation, su... ethoxyalkylation, thiolation, sulfation, phosphorylati... fit copolymerization along with many other modifi... chemical modification affords a wide range of derivat... specific and use applications in diverse areas mainly... biotechnological fields. Assorted modifications includ... cyclodextrin, dendrimers, and crown ethers have also e... inal macromolecules. The versatility in possible modifi... derivatives presents a great challenge to scientific cr...

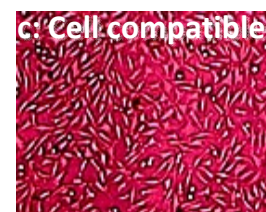


Figure. a) Synthetic route of biopolyimides, b) Biopolyimide film with high transparency, and c) L929 fibroblasts extending well on biopolyimide films.

products from genetically-manipulated microorganisms. The study, which was published in the on-line 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.

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 CO₂ emission by transportation. Prof. Kaneko and Prof. Takaya made additional calculation for materialization; the price of the biopolyimide film (density: 1.2 g/cm³) is expected around 30 USD/kg which is similar to food additives and is lower than the toughened glass (density: 2.5 g/cm³) of automobiles, CO₂ 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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