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PRESS RELEASE

Source: Toyohashi University of Technology, Japan, Committee for Public Relations

Title: Artificial enzyme for asymmetric synthesis using a synthetic chiral polymer
Subtitle: Enantioselective desymmetrization of cyclic anhydrides using a chiral polymer catalyst

Full text:
Enzymes, high-molecular-weight chiral polymeric compounds, are complex biological catalysts. Capture of the substrate molecule, catalyzing the reaction, and release of the product are three important events performed by enzymes. In order to accomplish these important events using a synthetic catalyst, the catalyst must necessarily have a large molecular weight so that it can act as a highly specific catalyst. However, synthetic chiral polymers for this purpose have not been designed so far. A research team in the Department of Environmental and Life Science at Toyohashi University of Technology has investigated a novel synthetic method for preparing chiral polymers containing repeating units of cinchona sulfonamide.

The lead author Shohei Takata said, "After testing many reaction conditions for the polymerization, we have synthesized chiral polymers containing cinchona sulfonamide repeating units. Chiral polymers are easily prepared by the method we established."

"We have found that Mizoroki-Heck coupling was successful in synthesizing cinchona sulfonamide polymers," explains the leader of the research team, Professor Shinichi Itsuno, "Moreover, our chiral polymers showed high catalytic activity in asymmetric reactions." Various kinds of such chiral polymers may be synthesized using this newly developed methodology to obtain various types of synthetic enzymes for specific reactions.

Furthermore, the chiral polymers developed in this study are insoluble in the usual organic solvents or water. The insoluble polymeric catalysts can be packed into a column, into which the substrate compounds can be introduced. The desired product can then be continuously obtained from the column. Without a usual reaction vessel, a continuous flow system may be possible using the polymeric catalyst. The flow system is a necessary technology for the automation of fine chemical syntheses.

Funding agency: This work was partly supported by a Grant-in-Aid for Scientific Research on Innovative Areas “New Polymeric Materials Based on Element-Blocks (No.2401) and Scientific Research (C) JSPS KAKENHI Grant Number JP15H00732, JP15K05517.”

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Reference:
Shohei Takata, Yuta Endo, Mohammad Shahid Ullah, and Shinichi Itsucno (2016). Synthesis of cinchona alkaloid sulfonamide polymers as sustainable catalysts for the enantioselective desymmetrization of cyclic anhydrides, RSC Advances, 6 (76), 72300-72305. 10.1039/C6RA14535C

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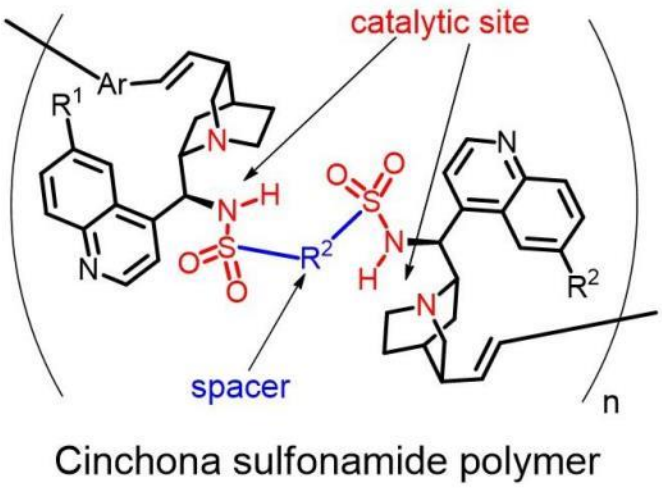
Figure 1:



Cinchona sulfonamide polymer

Caption: Structure of cinchona sulfonamide polymer.

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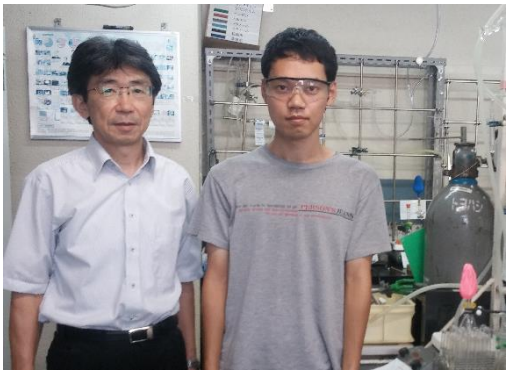
Figure 2:



Caption: Prof. Itsuno and Shohei Takata

Keywords: CHEMISTRY/PHYSICS/MATERIALS SCIENCES, INDUSTRIAL ENGINEERING/CHEMISTRY, MATERIALS, PHARMACEUTICAL SCIENCES, PHARMACEUTICAL/COMBINATORIAL CHEMISTRY, POLYMER CHEMISTRY