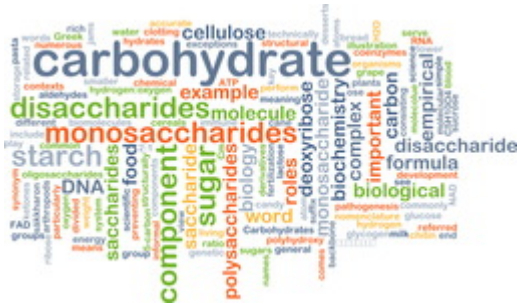
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Development of Immobilized on Solid Support Phosphoric Acids for the Catalysis and Synthesis of Carbohydrates

TECHNOLOGY NUMBER: 2021-146



OVERVIEW

A novel suite of chiral catalysts immobilized on solid supports

- Site-specific protection of hydroxyl groups of mono- and poly-saccharides
- Reusable chiral catalysts for custom carbohydrate synthesis and other selective reactions

BACKGROUND

Carbohydrates are essential molecules with numerous biological roles. The exploration of the functions and medicinal properties of carbohydrates has been hampered by the difficulty of synthesizing the complex oligosaccharides and glycoconjugates needed. Several decades ago, similar difficulties plagued the study of proteins until Robert Merrifield developed his Nobel prize-winning solid phase peptide synthesis technology. Now referred to as Merrifield resins, this technology enabled the automated synthesis of bespoke peptides and revolutionized academic, biotechnology, and pharmaceutical research. Carbohydrate synthesis has proven to be more challenging, due to such factors as multiple functional groups present on carbohydrates, axial versus equatorial configurations, linear and branched chain configurations, and so on. Although one pot methodologies are being developed, these techniques still rely on expensive, solution-phase catalysts to effect the regio- and stereo-selective addition reactions required.

INNOVATION

Researchers in the Chemistry Department at the University of Michigan have developed a suite of chiral catalysts immobilized on solid supports. These catalysts offer complementary

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Category

Chemical Processes and Synthesis
Engineering & Physical Sciences

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regioselective routes to protect specific hydroxyl groups on mono- and polysaccharides and thereby enable efficient, high-yield synthetic routes to custom carbohydrates. By virtue of the solid support, the catalysts are easily separated from the reaction products and are reusable. Furthermore, packed columns containing the solid phase catalyst may be integrated into a larger process flow, potentially enabling the automated synthesis of bespoke carbohydrates. Beyond carbohydrates, these chiral catalysts have been shown to be useful in a variety of stereoselective syntheses as well.