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Patent Search

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Abstract:

A novel class of non-toxic, copper-free catalysts has been introduced, specifically tailored for use in click chemistry applications geared towards bioconjugation. Draw inspiration from both enzymatic principles and advanced synthetic chemistry, these catalysts have demonstrated efficiency comparable, if not superior, to traditional catalysts, without the associated cytotoxicity concerns. They are compatible with a broad spectrum of biomolecules and simplify post-reaction purification processes. This invention holds potential to revolutionize the fields of biomedicine, biotechnology, and material science, offering safer and more versatile tools for bioconjugation.

Complete Specification

Description:The present invention pertains generally to the field of organic chemistry, and more specifically, to the development of non-toxic, copper-free catalysts for the bioconjugation processes employing click chemistry techniques. This invention finds particular application in the realm of biotechnology, pharmaceuticals, diagnostics and materials science, where the need for safe and efficient methods to conjugate biomolecules without the detrimental effects or complications associated with copper catalysts is paramount.

Background of the invention:

Click chemistry, as introduced in the late 20th century, has emerged as a powerful and versatile tool in the field of organic synthesis. The term "click chemistry" typically refers to a subset of reactions that are modular, wide in scope, yield very high chemical yields, generate only inoffensive byproducts, and are stereospecific. These reactions are inherently simple and can be executed under mild conditions. Among these, the copper(I)-catalyzed azide-alkyne cycloaddition (CuAAC) has gained significant attention because of its efficiency and broad applicability in the creation of carbon-heteroatom bonds. This has led to its widespread application in various fields such as drug discovery, polymer chemistry, and especially in the realm of bioconjugation.

Bioconjugation refers to the covalent linking of two biomolecules, such as proteins, peptides, nucleic acids, or carbohydrates. This linking can result in hybrid molecules with enhanced or combined functionalities that are not possible with the individual entities alone. In the context of modern scientific research and product development, bioconjugates have proven invaluable in diagnostics, therapeutics, and various biotechnological applications.

One of the key challenges in bioconjugation using click chemistry, however, has been the reliance on copper as a catalyst. While copper-catalyzed click reactions are efficient, the use of copper, particularly in biological systems, comes with inherent problems. Firstly, copper ions can be cytotoxic, making them unsuitable for many

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