Auburn University

Innovation Advancement & Commercialization

Catalytic System for High Efficiency and High Yield in Organic Synthesis

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Reference: Copper Catalyst

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References

Li, Y., et al. *J. Org. Chem.* 2010, **75**, (5), 1807–1810. (*steroid synthesis*)

Wu and Gorden, *Eur. J. Org. Chem.* **2009**, 503–509. (*aryl methylene synthesis*)

Wu and Gorden, *Tetrahedron Letters.* **49** (2008), pp. 5200–5203. (*Cu extraction*)

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Overview

Auburn University is seeking a licensee or development partner for a novel reagent for the simpler, faster, greener and higher yield synthesis of organic compounds, including pharmaceuticals. This metal based catalyst can increase yields, lower costs and lower the environmental impact of chemical processing. Additionally, a modification of the compound can be used to simplify purification steps. The primary potential application for this invention is pharmaceutical production.

Advantages

- Very high yields (up to 99%) with minimal side products have been demonstrated, suggesting lower production costs through increased production and simplified purifications
- Faster reaction times can reduce capital costs through smaller vessel sizes
- Lower temperatures and the lack of dangerous residual chemicals make reactions more environmentally friendly
- Soluble in a variety of solvents and is not sensitive to air or water, enabling use in a wide array of processes, including oxidation of non-polar compounds such as steroids
- Solid-phase analog can simply and selectively remove 100% of copper, enabling use of copper when its presence downstream or in final products cannot be tolerated

Description

The development of new metal catalysts has been of wide interest for organic chemical synthesis. Unfortunately, their use in the pharmaceutical industry has been limited for many reasons, including costs, environmental concerns and/or low yields.

This Auburn technology regards a new copper-based catalyst, based on a 2-quinoxalinol salen ligand. This metal complex has been demonstrated as an effective catalyst in organic synthesis, producing yields as high as 99%. The catalyst has also been shown to reduce reaction times, be effective over a wide range of reaction conditions and solvents and are relatively simple to prepare compared to other systems. The system has been used to synthesize Δ^5-steroidal substrates (highly useful synthetic building blocks) and to oxidize aryl methylenes.

Additionally, a solid-phase analog of this ligand can simply, selectively and completely remove copper from the system after reaction completion. The resulting copper-resin complex changes color and precipitates from organic solutions, allowing for simple separation and recovery of the majority of the copper for possible reuse. Thus, residual copper will not potentially interfere with subsequent reaction steps, negatively impact the final product or be released into the environment. Use of this scavenging compound is compatible with other sources of copper-based catalysts as well and may have other applications, including remediation.

Status

- U.S. Patent 8,445,678 (includes composition of matter claims)
- Excellent yields (up to 99%) with faster reaction times and at lower temperatures have been demonstrated for two chemical systems, including steroids synthesis
- Rapid, selective extraction and recovery of copper has been demonstrated in the lab

Licensing Opportunities

- This technology is available for exclusive or non-exclusive licensing
- Joint development opportunities include funded research or a joint venture