Chemical System for Selective Extraction and Recovery of Copper

Inventors:

Dr. Anne E. V. Gorden
Associate Professor
Department of Chemistry & Biochemistry

Xianghong Wu
PhD Graduate
Department of Chemistry & Biochemistry

Reference:

Wu and Gorden, Tetrahedron Letters. 49 (2008), pp. 5200–5203. (link)

Contact:

Brian Wright
Auburn University
Innovation Advancement & Commercialization
334-844-4977
dircomm@auburn.edu
iac.auburn.edu
Reference: Copper Extraction

View More Available Technologies

Overview: Auburn University is seeking a licensee or development partner for a novel reagent for the selective extraction and recovery of copper. This technology will enable the use of superior copper-based organic synthesis steps that are currently impractical due to concerns of residual metal in subsequent reaction steps and final products. Potential applications for this invention include pharmaceutical production and remediation.

Advantages:

- **ENABLING —** Can remove 100% of copper from a sample, enabling use with synthesis protocols that cannot tolerate copper in downstream steps or final products
- **SIMPLICITY —** Copper-resin complex changes color and precipitates from organic solutions, allowing for simple separation
- **TIME-SAVING—** Binding is selective, stable and rapid, keeping processing time low
- **COST EFFICIENT—** Simple chemical treatment allows for recovery of majority of copper, thereby limiting costs associated with replacing expensive reagents
- **VERSATILE —** Unlike standard cation scavengers, is not pH/solvent dependent and does not bind organics

Description: Copper salts are often applied as highly efficient catalysts in a variety of organic synthetic procedures on a lab scale. Despite often being superior to other methods, these copper catalysts typically are not used industrially due to residual copper interfering with subsequent reaction steps and/or the negative impact of any residual metal in the final product or being released into the environment.

Solid-phase extraction technology for the selective recovery of copper has not previously been described in the literature. Such technology has considerable potential and would allow many catalytic or coupling reactions commonly used in the synthetic laboratory to be more accessible for use in combinatorial processes or in industrial applications. In addition, this would create a more efficient and readily recyclable system thereby limiting the need for costly copper reagents.

The research team at Auburn University used an optimized synthetic route to develop 2-Quinoxalinol salen ligands supported on resin that swells in many organic solvents. The resulting reagent was shown to efficiently and selectively extract copper (II) ions from organic solvents within 30 minutes under a variety of experimental conditions. Mild reducing conditions allowed for recovery of up to 70% of the extracted metal ion. This approach has been shown to selectively extract copper even from a mixture containing other +2 metal ions such as nickel and manganese. Excess resin can be removed simply by changing the solvent of the system. Additionally, the resins could also be applied in environmental or materials chemistry as a metal scavenging agent. In the future, they could be used to design new solid reagents that selectively extract other metals or improve on the selectivity or application of this system.

Status:

- U.S. Patent 8,445,678 which includes composition of matter claims
- Rapid, selective extraction and recovery of copper has been demonstrated in the lab
- This technology is available for exclusive or non-exclusive licensing

Early Stage → *Lab scale* → *Pilot scale* → *Market Ready*