MORGAN STATE UNIVERSITY
DIVISION OF RESEARCH AND ECONOMIC DEVELOPMENT
OFFICE OF TECHNOLOGY TRANSFER

Executive Summary

Rhodamine-based Sensors

Innovation:
Two new rhodamine derivatives called L1 and L2 were developed, with different substituent groups on chromone ring designed for rapid, selective, and colorimetric sensors for Cu^{2+}, in which the spirolactam to ring-opened amide process was utilized for the detection of Cu^{2+} in aqueous media. L1 and L2 were designed and synthesized from a parent Rhodamine B and aromatic aldehydes in a two-step Schiff base condensation, using microwave-assisted organic synthesis and utilized towards sequential fluorescence detection of aluminum ion (Al^{3+}) and azide (N^{3-}) in aqueous acetonitrile solution.

Market Need:
Copper is third in abundance among the essential heavy metals in human bodies and plays an important role in various physiological processes. It is essential for the activation of dioxygen, which is essential for the survival of all living organisms. Copper also has multiple functions, as iron absorption, hemopoiesis, diverse enzyme activities and in the redox processes. However, abnormal levels of copper ions can lead to vomiting, lethargy, increased blood pressure, acute haemolytic anemia, neurotoxicity, and neurodegenerative disease. In addition to copper, aluminum is another essential micronutrient that can have adverse effects in higher abundances. Thus, there is a need for detection methods that can be applied to multiple substrates. Further, detection can be extended to environmental samples.

Intellectual Property:
Two Intellectual Property Disclosures, and a Provisional Patent Application (#62/883,785) and Non-provisional Patent Application (#16/987,688) combining the two disclosures have been filed.

Stage of Development:
L1 and L2 complexes were used to detect N^{3-} via the metal-displacement approach which displayed an excellent selectivity and sensitivity towards N^{3-}. Thus, upon the addition of N^{3-} to complexes, the intensity of the 585 nm band decreases, indicating release of L1 and L2 from the aluminum complexes. Stoichiometry and binding mechanisms for both sensors are well characterized and established by the respective spectroscopic techniques. These results clearly demonstrate that L1 and L2 sensors described herein will be useful for the analysis of Al^{3+} and N^{3-} in environmental samples and biological studies.

Technology Transfer Opportunity:
Biosensors for copper and other can be fielded operationally to show the effects on the human body, as an excess of this element can be toxic. The heavy metal testing industry is almost $3 billion (2019), with environmental, food, and blood testing among its biggest market segments. This presents a major potential opportunity for Morgan State University.

Key Investigators:
Dr. Fasil Abebe

Field(s) of Use:
-Diagnostics
-Chemistry
-Toxicology

Key Words:
-Heavy metals
-Abnormal
-Rhodamine

Advantages:
-Simple chemical detection
-Can be used on multiple heavy metals
-Can be used in conjunction with azides

Status:
Multiple patent applications have been filed.

Links:
Inventor Bio

Reference Numbers:
082/2020 and 108/2021

Tech Transfer Contact:
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