Submission Date: 6/10/2025

2024 Academic Year Bio-SPMs Collaborative Research
Research Report Summary

Title of the research project		Versatile Au@ZIF-8 nanocomposites for colorimetric detection, fluorescence sensing and photodegradation	
PI (Person in charge of the research project)	Name	Marienette Vega	
	Affiliated Institution and Department/Division/etc.	Materials Science and Engineering Program, College of Science, University of the Philippines, Diliman	
	Position	Associate Professor	
Bio-SPMs that you used (Check the boxes)		✓	Atomic resolution/3D-AFM
		☐	High-speed AFM
		☐	SICM
		☐	AFM for Cell Measurement
Collaborative NanoLSI Faculty Members		Prof. Hitoshi Asakawa	

Describe the summary of the research project

This project focuses on developing a multifunctional nanocomposite capable of detecting contaminants through color changes, fluorescence quenching, and neutralizing them through photodegradation. The goal is to establish a stable and effective morphology that supports multiple detection modes, particularly colorimetric and fluorescence spectroscopy. To achieve this, gold nanoparticles (AuNPs) and gold nanostars (AuNSs) are integrated with a zeolitic imidazolate framework-8 (ZIF-8). The system is tested using methylene blue as a model analyte due to its structural similarity to biomarker compounds.

Accurate determination of the nanocomposite's structure is critical, as its morphology directly influences sensing performance and degradation efficiency. Characterization techniques such as 3D atomic force microscopy, UV-vis-NIR spectroscopy, and fluorescence spectroscopy are essential to confirm the composite's structure and functionality. It has been challenging to determine whether the gold nanoparticles are embedded within the framework or decorated on the surface of ZIF-8. Some evidence from UV-Visible spectroscopy leads to the latter. Initial SEM images were inadequate for due to overcharging issues of ZIF-8. Characterization of the nanostructures with the NanoLSI's 3D AFM is especially valuable in overcoming the key obstacle in the study.

*This form (Form 3) will be open on the NanoLSI website in the following academic year.

*Note that this form should be prepared in one A4-size paper.

*Submission Deadline: May 9, 2025 (Friday). Submit it as a PDF file.

*Submission Destination: the person in charge of Bio-SPMs collaborative research at WPI-NanoLSI, Kanazawa University

Email: **nanolsi_openf01@ml.kanazawa-u.ac.jp**