

Chemistry Departmental Colloquium

Thursday, November 30, 2023

4:30 p.m. ~ WTHR 104

"Enhanced Vibrational Spectroscopy - The Surface is Everything"

Abstract:

Surface-sensitive vibrational spectroscopic techniques rely on molecular interactions with relevant interfaces. For instance, surface-enhanced Raman scattering (SERS) requires that molecules interact with the metal surface at short distances of 2 nm or less without disrupting the surface atoms. In this presentation, anisotropic nanostructures such as gold nanostars will be used in conjunction with SERS to detect trace molecules. Two challenges and approaches to better predict structure-function behavior of noble metal nanoparticles will be discussed. A combination of experimental measurements that provide molecular-level insight coupled with semi-empirical modeling will be shown to improve the systematic use of gold nanostars by providing a method for predicting the stability and hence, the fate of nanomaterials in various environmental conditions. After these considerations, localized surface plasmon resonance (LSPR) spectroscopy and SERS will be exploited for the direct, qualitative and quantitative detection of small biologically relevant molecules. In the future, these results could be expanded for different nanomaterial shapes, compositions, and molecular targets.



**Amanda Haes, Professor
University of Iowa
Department of Chemistry**

Biography:

Dr. Amanda J. Haes is currently a Professor in the Department of Chemistry at the University of Iowa. She joined the faculty in the Chemistry Department at the University of Iowa in 2006, after earning a Ph.D. in Chemistry from Northwestern University and serving as a National Research Council Research Associate at the Naval Research Laboratory. She has served as a standing member for the Instrumentation and Systems Development (ISD) Study Section for NIH and is also serving as a temporary Program Director (Rotator/Expert) for the NSF. Her research group combines both experimental and computational methods to predict and exploit the size dependent properties of metal and metal oxide nanomaterials in both fundamental and applied studies in the areas of Raman spectroscopy, plasmonics, and surface-enhanced Raman scattering. Professor Haes focuses on a number of key issues related to nanoscience and nanotechnology including quality control of nanomaterials and surface chemistry, impacts of intermolecular interactions and surface selection rules on vibrational features of molecules, as well as quantitative sensor development for applications in biology, chemistry, dentistry, and environmental science. These studies are and/or have been funded by the National Science Foundation, National Institutes of Health, Office of Naval Research, and Roy J. Carver Charitable Trust. Recently, Professor Haes was selected as a "Must See" presenter at a National American Chemical Society Conference and serves as a standing member of the National Institutes of Health Instrumentation and Systems Development Study Section. In addition to her research, Professor Haes serves as PI and Co-Director of a National Science Foundation funded Research Experience for Undergraduates summer program in the area of nanoscience and nanotechnology. She and her group have also hosted over 1500 elementary and middle school students, teachers, and parents from local communities to the University of Iowa campus for various STEM activities.