

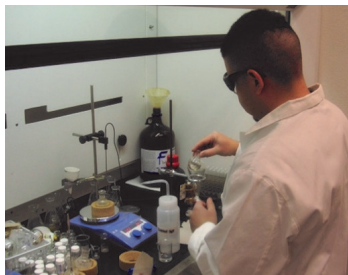
Atmospheric Chemistry

For example one research area in the Department involves the study of natural and anthropogenic sources and emissions of trace gases under natural and perturbed conditions, such as oceanic iron fertilization and elevated atmospheric carbon dioxide (CO_2). Iron fertilization is being explored as a means to capture more CO_2 in the oceans and could help to alleviate global warming.



Organic Chemistry & Catalysis

Lewis acid catalysis is an important tool of modern organic chemistry. Among the great variety of known Lewis acids, Ln(III) triflates are unique. They possess a strong Lewis acid character and are highly selective. Another very important property of lanthanide triflates is their stability in water. One important goal is to develop novel catalysts in order to perform asymmetric Lewis acid catalyzed reactions in aqueous media. Additionally, the focus is on target-oriented synthesis of natural products and/or bioactive compounds which are subsequently tested for their anti-cancer properties by collaborators within the department of New Mexico Tech.



ABOUT THE NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY

New Mexico Tech specializes in the sciences, engineering, and natural resource fields. M.S. degrees are offered in most departments, and the Ph.D. is offered in several fields, including Chemistry. Faculty members are deeply involved in research, and many students are employed in research activities. In addition to the College Division, the Institute includes multiple research divisions providing ample opportunity for collaborative research. The divisions most closely related to chemistry are the New Mexico Bureau of Mines and Mineral Resources, the Petroleum Recovery Research Center, the Energetic Materials Research and Testing Center, and the Langmuir Laboratory for Atmospheric Research. The operational center for the world renowned Very Large Array, a radio telescope, is located on campus and shares many research activities with Tech.



CONTACT

Department of Chemistry
Jones Hall 259
801 Leroy Place
Socorro, NM 87801

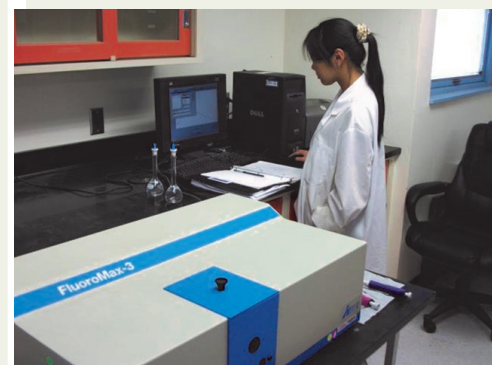
(575) 835-5263 (Phone)
(575) 835-5364 (FAX)

chem.@nmt.edu

Chemistry at The New Mexico Institute of Mining and Technology

The Chemistry Department of NMIMT offers the Master of Science and Doctor of Philosophy Degrees. The Department reflects a balance between pure and applied chemistry. While the faculty is qualified in the major divisions of chemistry, such as organic, analytical, physical and biochemistry, the main research thrusts are in:

Atmospheric
Biomedical
Environmental
Computational Modeling
Natural Product
Organic Chemistry
& Catalysis
Physical Organic
Synthetic & Medicinal

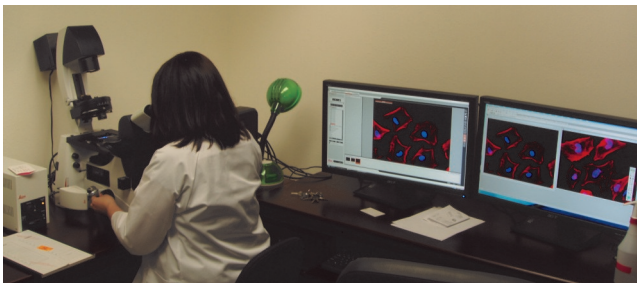


NEW MEXICO TECH

DEPARTMENT OF CHEMISTRY

Biochemistry

The area of biochemistry is represented by the studies of cancer metastasis mechanisms. The majority of cancer deaths arise from the metastatic spread of primary tumors. The most clinically relevant processes, invasion into surrounding tissue and distant organs, are however the least understood. Recent studies in our Department demonstrate that tumor cell invasion may also result from the disorganization and clustering of specific membrane proteins or lipids and their assembly with signaling molecules inducing the activation of associated downstream signaling pathways. Thus, the current projects aim to elucidate the spatial organization of cell surface molecules and activation of linked signaling pathways as cancer cells acquire the invasive phenotype by using human models of cancer cell progression and assessment in clinically relevant specimen.



Computational Modeling

Our Departmental computational modeling facilities allow students to access state-of-the-art software packages and computers. Students can complete calculations using modeling lab facilities in support of other research projects. Or, students can request modeling projects be completed by trained facility staff. Students are also engaged in modeling projects as part of the undergraduate curriculum. Current software packages are available for quantum chemical calculations (*Gaussian*, *MOPAC*, etc.) and bioinformatics (*Autodock*). Software is also developed in-house for custom calculations; such as Monte Carlo modeling. Funds are available for the purchase of additional software packages as needed.

Environmental Chemistry

Another research direction focuses on molecular understanding of the composition of natural waters and how it affects both the ecological function of aquatic ecosystems, the transport and fate of nutrients and pollutants, and the development of analytical methods for natural waters. For example, one current project examines the composition, chemical reactivity, and biological utilization of the naturally-occurring organic carbon that is present in all natural waters. This material is an important component of the global carbon cycle. However, the chemical mechanisms that determine its molecular structure and its fate in the environment are not well understood. We use a suite of analytical and biochemical methods to examine this material and to study its physical, chemical, and biological transformations in the environment.

Natural Product Chemistry

Another exciting research direction in the Department involves bioactivity-guided natural product isolation. One project exploits the medicinal value of Amaryllidaceae plant extracts that has been recognized for a long time. It dates back to at least the fourth century BC, when Hippocrates of Cos used oil from the daffodil *Narcissus poeticus* L. for the treatment of cancer. In more recent times, more than 100 structurally diverse alkaloids, possessing a wide spectrum of biological activities have been isolated from the Amaryllidaceae species. The Department is actively involved in this worldwide effort and the isolated alkaloids are chemically derivatized and evaluated for various types of biological activities.

Physical Organic Chemistry

Investigations in physical organic chemistry emphasize new dye synthesis in conjunction with theoretical treatment such as quantum chemical modeling for optimal functional properties. Photophysical and electrochemical studies such as UV-Vis, fluorescence and cyclic voltammetry provide the basis for understanding optical features. The applications of this research lead to a broad array of applications such as fluorescent biomarkers for biochemical analysis, white-organic light emitting devices (WOLEDs) as well as dye-doped nanocomposites. These nanocomposites show potential for the direct solar energy conversion of carbon dioxide to an alternative and sustainable energy source such as methanol.



Synthetic and Medicinal Chemistry

Synthetic and medicinal chemistry are important research directions in the Department. The syntheses of medicinally promising compounds are usually accompanied by the discovery of novel synthetic methodology. Several synthetic groups in the Department are involved in highly collaborative drug discovery efforts. The synthesized compounds possessing promising biological activities are evaluated using various molecular biology assays *in vitro* by collaborators at New Mexico Tech and in animal models of human disease by several national and international collaborators.