COMPLEX SYSTEMS & ENVIRONMENTAL FRONTIERS

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Dr. Louie conducts research in the field of environmental nanotechnology and has developed advanced analytical methods to characterize nanomaterials and identify their interactions in complex environmental samples. She was recently recognized as an Emerging Investigator by the Royal Society of Chemistry Environmental Science: Nano journal. Her group focuses on the interactions of natural or engineered nanoparticles with aqueous contaminants and the influence of water chemistry on these interactions. The materials investigated in Dr. Louie's laboratory include photocatalytic nanomaterials for water treatment and polymeric nanomaterials for drug delivery in humans or pesticide delivery in agricultural settings.

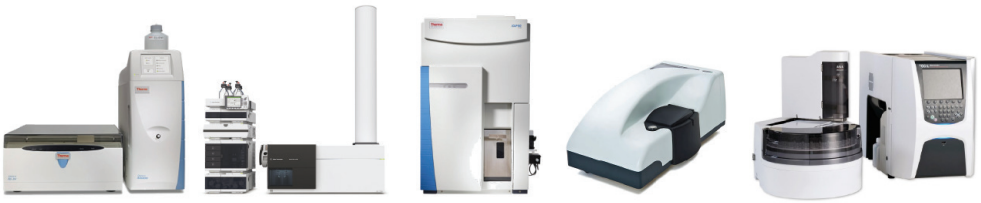
CHARACTERIZATION OF NANOMATERIALS IN ENVIRONMENTAL SAMPLES

The Louie group uses specialized techniques in liquid chromatography (LC) for separation and analysis of complex environmental samples to cover a wide range of analytes, that include:

Small Organic Molecules: An LC-Quadrupole Time of Flight Mass Spectrometry system (LC-QTOF MS) enables identification of unknown constituents in water. Dr. Louie's group applies LC-QTOF MS to identify and compare the formation of degradation byproducts of contaminants such as pesticides in water treatment processes using photocatalytic nanomaterials. Several databases (including METLIN and water analysis) are integrated with the instrument software to identify unknown sample constituents.

Macromolecules: A Size Exclusion Chromatography (SEC) system is used with a full suite of online detectors (UV-Vis, fluorescence, dynamic and multi-angle light scattering (DLS and MALS), refractive index (RI) and total organic carbon (TOC)) for separation and characterization of aqueous polymer, biomolecules, and humic substances. Dr. Louie's group characterizes sorption of aqueous pollutants to engineered or naturally occurring macromolecules, as well as sorption and removal of macromolecules and associated contaminants onto nanoparticles.

Nanoparticles and Colloids: An Asymmetric Flow Field–Flow Fractionation system (AF4) is integrated with UV-Vis, fluorescence, DLS, MALS, RI, and TOC detectors for separation and characterization of nanoparticles or colloids. Dr. Louie's group is developing novel applications to directly monitor the loading of pharmaceuticals and other compounds in polymeric nanoparticles and evaluate the extent and kinetics of their release from or uptake into the nanoparticles.



(a) ***(b)*** ***(c)*** ***(d)*** ***(e)***

Figure (a) *shows a Thermo Dionex Acquion IC.* ***Figure (b)*** *shows a Agilent 6545 QTOF.* ***Figure (c)*** *shows a Thermo iCAP RQ ICP-MS.* ***Figure (d)*** *shows a Malvern Zetasizer Nano ZS.* ***Figure (e)*** *shows a Shimadzu TOC-L.*

Publications

1. Shakiba, S.; Astete, C. E.; Paudel, S.; Sabliov, C. M.; Rodrigues, D. F.; Louie, S. M. Emerging investigator series: Polymeric nanocarriers for agricultural applications: Synthesis, characterization, and environmental and biological interactions. Environ. Sci.: Nano, 2020, 7, 37-67.

2. Shakiba, S.; Hakimian, A.; Barco, L.; Louie, S.M. Dynamic intermolecular interactions control adsorption from mixtures of natural organic matter and protein onto titanium dioxide nanoparticles. Environ. Sci. Technol, 2018, 52, 14158-14168.