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USING CELL CYTOMETRY AND RAMAN SPECTROSCOPY TO CHARACTERIZE MICROPLASTIC PARTICLES <300 MICRONS IN WATER SAMPLES

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The environmental hazards associated with microplastics come from the physical accumulation of particles in a myriad of organisms, as well as the increased exposure of life forms to chemicals and biofilm-associated microorganisms associated with polymer surfaces. Concern is growing over the presence of microplastic particles <10 micron that are found in water, soils, and air samples. Typically, optical microscopy is used to quantify and chemically characterize larger microplastic particles (≥50 microns), however smaller particle analysis becomes extremely challenging and is fraught with operator bias. To address the need for an accurate, rapid, unbiased, and quantitative characterization of microplastics ≤300 microns, multistage fractionation was used to separate particles into less than 300- and 70-micron subsamples, followed by counting using a cell cytometer. This procedure allows for the quantification of microplastic particles as small as 1 micron and allows for replicate measurements to determine the statistical distributions of particle size and mass. Multiple Raman spectral scans of the subsamples, followed by spectral deconvolution, provides chemical information related to polymer composition and degree of oxidative weathering. Known amounts of polyethylene microspheres of a specific diameter are added as an internal standard to samples as they are easily distinguished from microplastic particles and provide a measure of percent recovery. This methodology was used to characterize microplastics ≥1 micron in size present in real-world water samples ranging from agricultural runoff with a high suspended clay content to samples collected from open water columns.

6:30-7:00 pm Social time *Join early to meet Oklahoma chemistry students and professionals from around the state.*

7:00-8:00 pm Presentation
The meeting will be virtual via zoom.

This meeting has a waiting room. Please wait for the host to let you in.

ZOOM LINK Meeting ID: **940 8226 4116** Passcode: **913789**

zoom meeting link

Mark Nanny Biographical Sketch

Mark Nanny is a Professor in the School of Civil Engineering and Environmental Science and in the Institute for Energy and the Environment at the University of Oklahoma. He is also the CEO and Cofounder of OptoKhemia Analytical LLC, a company that develops analytical methodology and sensors for quantifying emerging environmental contaminants. Mark received a B.S. in chemistry (1986) from Wayne State University, and a M.S. in chemistry (1989) and a Ph.D. in environmental chemistry (1994) from the University of Illinois, Champaign-Urbana. He spent two years as a post-doctoral researcher at Pennsylvania State University, before arriving at the University of Oklahoma in 1996. As an environmental chemist, his research interests focus on the environmental fate and transformation of anthropogenic compounds in complex systems and processes such as ground water aquifers and surface waters, soils and sediments, landfills, oil and gas produced waters, microbial influenced corrosion of steel infrastructure, and the reuse of treated wastewater. His passion for interdisciplinary research at the chemical-microbial interface has provided him the opportunity to mentor graduate students in environmental science, environmental engineering, and his collaborations with the OU Department of Chemistry and Biochemistry as well as in the Department of Microbiology and Plant Biology, to mentor graduate students in analytical chemistry, physical chemistry, and microbiology. His expertise in numerous spectroscopic, electrochemical, and chromatographic analytical methods led him in 2019 to form with four colleagues, OptoKhemia Analytical, a company that designs and implements in-situ nanophonic sensors and sensor networks for real-time and continuous detection of contaminants in water and air. As a PI or CoPI, Mark has brought in over $22.8°M in research funding through various programs in the National Science Foundation, the Office of Naval Research, US Environmental Protection Agency, United States Geological Survey, the OK State Department of Education, as well as Conoco Philips and EcoPetrol Colombia. He has published 69 research papers and book chapters, coedited the book Nuclear Magnetic Resonance Spectroscopy in Environmental Chemistry, and has two patents: one for the bioconversion of coal to methane and another for flow-through nanophotonic sensors.