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1-1-2017

## **Water Pollutants Analysis: Method Development to Identify Concentrations of Emerging Water Pollutants**

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### **Recommended Citation**

Vogler, Bernhard and Wu, Tingting, "Water Pollutants Analysis: Method Development to Identify Concentrations of Emerging Water Pollutants" (2017). *RCEU Project Proposals*. 266.

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**WATER POLLUTANTS ANALYSIS.** Method development to identify concentrations of emerging water pollutants.

**A Proposal for the Research and Creative Experience for Undergraduates (RCEU) Program, Summer 2017**

**Faculty Sponsors:** Bernhard Vogler, PhD, Chemistry, Tingting Wu, PhD, Civil and Environmental Engineering

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***Project Summary:***

Introduction: Surface water and groundwater are two major water sources that sustain human needs. Contamination of aquatic environment with thousands of trace organic contaminants (e.g. pharmaceuticals and personal care products (PPCPs), plasticizers, pesticides, surfactant breakdown products) has raised considerable toxicological concerns and urban runoff is one of the pollution sources. Furthermore, rapid development of industrialization, population growth, environment deterioration, and climate change have increased the water demand and shortage of clean water sources becomes an issue worldwide in recent years. As a result, utilization of non-traditional water resources such as treated wastewater and stormwater may represent a sustainable solution in the long run for communities with severe water stress. Therefore, cost-effective reduction of pollution associated with stormwater runoff and treated wastewater becomes even more imperative to protect public health. The overarching goal of this project is to develop and test novel low-cost multifunctional adsorptive media for water pollution control. **To establish the effectiveness of new processes analytical methods have to be developed.**

***Research Plan:***

We propose to use HPLC UV, and HPLC-MS, for quantitation purposes. For successful implementation of water treatment methods monitors for a set of key compounds have to be established.

We identify best HPLC conditions

- choice of column (separation medium) stationary phase
- solvent and buffer combinations (separation medium) mobile phase.

Plenty of these compounds exist only in lowest concentrations, thus pose a challenging problem for analysis with the additional complication that methods need to be rigid enough for quantitation purposes.

For a set of individual compounds we will establish multiple protocols to allow at all times quantitation of these compounds even in complex matrices. To rule out ambiguities of the analysis, multiple separation protocols (separation conditions) have to be established and concentrations of compounds of interest have to be verified with independent methods, here UV and MS.

***Student Duties:***

Run UV and MS samples; identify best HPLC conditions- columns and solvent and buffer combinations. Establish concentration curves over a wide range of concentrations.

***Tentative plan for the 10 week schedule:***

- week 1/2: familiarization with, H P L C , a n d H P L C - M S .
- week 3/4: building of reference data files on both, the HPLC-UV, and the HPLC-MS, in order to build concentration curves .
- week 5/6: familiarization with Primaide (Hitachi) HPLC-UV, Excel and Tracefinder (MS) for data analysis.
- week 7/8: analysis of data sets.
- week 9/10: refine measurements.

***Manuscript preparation:***

Dr. Vogler encourages all undergraduate student researchers to write up their results in the form of a manuscript for publication. The RCEU participant, under the supervision of Dr. Vogler, will help prepare the manuscript(s), which may include data from other undergraduate or graduate students.

***Expected Student Background :***

Students should have good background in General Chemistry, knowledge of Organic Chemistry is advantageous, so typically students with a major in Biology, Chemistry, and or Chemical Engineering should be ok. Previous exposure to analytical instrumentation is a clear benefit.

***Expected results and deliverables:***

The student will be exposed to important instrumental techniques such as mass spectrometric analysis, UV Measurements, preparation of samples in smallest concentrations, error analysis, literature studies. UV methods, HPLC-UV, and HPLC-MS are standard industry techniques in all fields of chemistry or chemistry related disciplines. Exposure to state of the art instrumental techniques will greatly enhance any students' career chances in chemistry or related disciplines. Instrumental skills are highly regarded.

***Faculty Supervision and Mentoring:***

HPLC-UV and HPLC-MS measurements will be supervised by Dr. Vogler. Manuscript preparation will be supervised by Dr. Vogler. We will hold regular group meetings weekly. The student will have access to the instructor at least once a day.