**Tiffany Wang**

**UROP Faculty Supervisor: Benjamin Kocar**

**Term: Summer 2015**

**April 17, 2015**

**[Project Title]**

**Project Overview**

*Provide an explanation/background of your UROP project that includes with whom and where you are conducting research.*

The recent onset of unconventional drilling techniques such as hydraulic fracturing (fracking) has resulted in rapidly increasing natural gas production in the United States. During unconventional well development, large quantities of water, sand, and other chemicals are injected under high pressure into deep, low permeability, natural gas-bearing shales, which then fracture and release natural gas. Fracking solutions, along with natural shale pore-water and released gas, then return to the surface—this milieu of natural and synthetic solutions is known as produced water, and contains a variety of anthropogenic and natural chemicals that are potentially toxic, including radioactive 226Radium (and other radioactive radium isotopes). At the surface, gas is separated from the produced water, which is either treated or returned to the deep subsurface through “disposal” injection wells. However, it is documented that improper handling of produced water has resulted in discharge directly to soils, sediments, and potentially, to aquatic systems. Unfortunately, little is known regarding the fate of contaminants (including natural 226Ra) in the environment. A better understanding of environmental chemical factors governing the fate and mobility of these potentially toxic constituents is sorely needed.

Radium isotopes are known to adsorb to solids present within soils and aquifers, resulting in retention in the subsurface after accidental release. This retention, combined with the variation radium isotope half-lives suggests that they could be used as indicators for historic contamination due to fracking activities. However, there is limited understanding of the surface chemistry of radium adsorption to specific minerals within the environment. Hence, this project’s goal is to study how radium adsorbs to different mineral surfaces and how radium may be transported in groundwater after an accidental release of produced water.

I will be working in Professor Kocar’s lab with graduate student Michael Chen in Building 48.

**Personal Role & Responsibilities**

*Describe what you are contributing to the project. Be specific about what your personal duties are and what you will be responsible for accomplishing throughout the term.*

I will be testing for the amount of radium adsorption to different compounds commonly found in the environment and creating isotherms based on the results.

**Goals**

*Explain what your personal goals for the UROP are, as well as what the overall aim is of the project.*

**Personal Statement**

*Briefly state why you are interested in this UROP and explain what you hope to learn from it.*

Fracking has allowed the United States to produce most of gas it needs. However, there are always environmental impacts that we need by wary of. Since fracking may be the United States’ primary source of gas for the time being, it is necessary to prevent harmful environmental impacts early on. This project would teach me more about the environmental impacts of fracking and how we can prevent the release of harmful chemicals in the future. In addition, I have had experience working in a lab before, but not for environmental chemistry related topics. Since I plan to have a career related to environmental chemistry, this is a good opportunity for me to see what exactly it may entail.