Student Research Grant

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Serene Tai

Dr. Jesse D. Carrick

19th April 2013

Nuclear energy continues to meet increasing global energy demands due to the expansion of human population. Today, nuclear power plants provide about 5.7% of the world's energy and 10.2% of the world's electricity.[1] However, these nuclear power plants also produce a significant amount of radioactive nuclear waste derived from lanthanides and actinides risking human health and the environment. Although most of the radionuclides in nuclear waste have

radiolytic degradation[5]. The goal of this research is to evaluate the significance of the heterocycle conformational rigidity and the overall ligand hydrophobicity towards the chemoselective coordination of Am^{3+} and Cm^{3+}.

I will be working with Dr. Carrick who will be supervising and monitoring my impetus as well as constant laboratory safety. Dr. Carrick and I will meet every day in the first couple of weeks. He will provide sufficient training for me to familiarize myself with the instruments in the laboratory and guide me on the proper laboratory procedures. After I have mastered the skills required to operate the instruments, I will conduct the experiments independently and report my daily progress to Dr. Carrick. Departmental instrumentation which will be used to support the research includes: NMR, rotary evaporator, Combiflash purification instrument, and recrystallization apparatus. A formal collaboration has been established with the chemical separations group at ORNL to test the efficacy of the synthesized ligands to extract Am^{3+} and Cm^{3+}. Ligands synthesized will also be submitted for radiolytic and hydrolytic stability evaluation and the data collected from solubility and kinetic studies will provide guidance in the future approach for the synthesis of more effective ligands.

In conclusion, this research will provide a new perspective to the advancement of nuclear power to generate a safer and more productive energy source in place of depleting fossil fuels. Besides, this project will also be a great contribution to the extension of my personal knowledge and practical competency in chemistry as well as promoting critical thinking skills necessary when I pursue my career aspiration in an analytical chemistry discipline.

References

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