**Statement of Purpose**

Can Li

Born and raised up in Jiaozuo, China, a small industrialized city badly affected by pollution, I have witnessed the worst scenario of inefficiencies in chemical processes. I am determined to make a contribution in science to help alleviate many of these similar problems that affect us collectively as a global society. I am strongly motivated to pursue a scientific career and receiving a PhD is the first step towards it. I’m especially interested in process systems engineering.

I decided to major in Chemical Engineering at Tsinghua University in 2012 as an undergraduate. In addition to attending strong courses within Chemical Engineering Department in which professors covered both the breadth and depth of chemical engineering fundamentals, I took various classes on computer programming. The power of computing and elegance of algorithms completely intrigued me. Having interest in both chemical engineering as well as computer programming motivated me to work at the intersection of computations and chemical engineering.

My strong passion for scientific research incentivized me to join the lab of Prof. Yushan Zhu when I was a sophomore, where I worked on computational design for a new enzyme that could catalyze the acylation reaction in cefataxime synthesis. I set up my own evaluating standards and a trial-and-error protocol. Finally, a new enzyme satisfying my evaluating criteria with five-residue mutations was found to bind cefataxime well *in silica*. This experience definitely provided me with a deep understanding of how to make a hypothesis and how to find an appropriate method to solve the problem based on the hypothesis in scientific research.

Due to my strong academic performance, I was awarded a scholarship to study at UW-Madison for fall semester of 2014, where I received firsthand experience of an American graduate school, as well as deepened my understanding of computation in chemical engineering. One of my classes was *Advanced Chemical Engineering Thermodynamics* where I discussed representative papers about molecular simulation with Prof. Nicholas Abbott and other PhD students to understand the research carried out in this area. I appreciated this approach of graduate study because it made me feel more involved in research by providing us with opportunities to discuss open problems. I also joined Prof. Christos Maravelias’ Process Systems Engineering group where I learned mathematical models and algorithms of Linear Programming and Mixed Integer Linear Programming problems. I tried to emulate the current best model for scheduling of multistage batch process under utility constraints with discrete-time formulation (Sundaramoorthy (2009)) by using continuous-time formation and built three new models. The correctness of my models was validated by solving sample problems. The academic atmosphere in the graduate school enhanced my motivation to pursue a PhD in America. Moreover, I became more interested in computations in chemical engineering when I noticed the significant increase in efficiency mathematical models could elicit. This motivated me to take more courses in numerical optimization and computer science back at Tsinghua University to establish my career as an outstanding researcher.

In order to be exposed to the frontiers of research, I undertook an internship in Prof. David Baker’s Lab at University of Washington this summer. I worked with a graduate student on de novo design of protein fiber using Rosetta, the computational tool of Baker Lab. We first docked our building blocks, someαhelical bundles, into helical structure, after which around five thousand docking structures were obtained and were ranked by their second largest interacting surface area. I selectively visualized 20% of the output structures and classified the docking structures into four topologies. I selected 26 structures with “good” topologies and interacting surface areas based on previous experience of the lab. My heuristics proved to be helpful after the graduate student ran further design protocols, which would output hundreds of thousands of design structures, laborious and intimidating for manual selection. He found excellent designs using the docking structures I selected. Moreover, after he used the 26 structures as training data to calibrate the parameters of the filter, more “good” docking structures were found and were in the process of design.

I was extremely amazed at the power of computation when I visualized one fiber-shaped order using transmission electron microscopy, when I significantly increased the profit using the scheduling models and when I imagined one computationally designed enzyme might replace a traditional chemical process. I love the life of consistently learning, discovering and evolving. That is why I decided to pursue a PhD degree. Of all the areas in chemical engineering, I’m especially interested in process systems engineering. The methodologies in process systems engineering, such as optimization, control theory, have been widely used in chemical problems including production, separation, scheduling, and distribution, which perfectly matches my keenness to improve the efficiency of chemical processes. Finally, I’m well prepared for pursuing a PhD in process systems engineering owing to my rich research experience and excellent background in mathematics and computer science. I’m always a good cooperator in my groups in China and America where I have closely collaborated and communicated with students and postdocs from different cultural and academic background.

UW-Madison CBE PhD program has a solid curricula and faculty working on my interested research areas. I’m especially interested in Dr. Christos Maravelias and Dr. Victor Zavala’s work on computational optimization. I admire Dr. James Rawlings, one of the recognized leaders in control theory. My background also pertains to the work of Dr. Jennifer Reed and Dr. Michael Graham.

After receiving a PhD degree, I plan to be a leading scientist in academia contributing to the advancement of energy conservation and environment protection. I look forward to collaborating with colleague on solving complex problems, and guiding students through the exciting process of scientific discovery.