

I recently spent four months (August 26th – December 17th, 2011) in Manchester, United Kingdom researching at the University of Manchester under the advisement of Drs. Anthony Freemont and Brian Saunders. My research project was titled, "Improvement of the yield strain of double cross-linked microgels." For this project I focused on improving the design of a microgel-based system for nucleus pulposus tissue engineering applications by incorporating a second polymer network to increase energy dissipation during loading. My research experiences at the University of Manchester provided invaluable training in particle synthesis procedures and characterization techniques that will be valuable for the remainder of my academic career. In addition to performing research, my studies abroad also provided me with an awareness of the differences between cultures, both socially and scientifically.

The research I performed at the University of Manchester provided invaluable training in synthesis and characterization techniques that will be important for the remainder of my academic career. Specifically, my project focused on improving the design of a microgel-based system for nucleus pulposus replacement. Microgels are cross-linked polymer particles that are capable of swelling in a solvent (in this case water). Drs. Anthony Freemont and Brian Saunders have previously developed a microgel-based system that shows promising results *ex vivo*; however, the material suffered from poor ultimate yield strain and brittle failure. During my research abroad, it was my responsibility to develop a method to improve the microgel's mechanical properties. Incorporation of a second loosely cross-linked polymer network allows for more mobility during loading and increases energy dissipation. By adding this second network to the original microgel material, I was able to increase both compressive strength and modulus over 10x, as well as the yield strain significantly. The results from this study are currently being drafted for publication. Experience synthesizing and evaluating particle-based systems compliments my doctoral research in fiber-based composites. Following my graduation in June 2012, I plan on using these experiences to eventually become a professor.

Performing research in Manchester, UK also provided me a unique opportunity to observe cultural differences and gain a global perspective. I will use this experience to promote international education and research as a professor throughout my career. Additionally, I understand the importance of international collaborations and I plan on continuing to collaborate with the University of Manchester in the future.

The time I spent at the University of Manchester was very important for my academic development. This research was made possible through travel awards from the Office of International Programs. I am very thankful for their assistance in making this possible.



Above: University of Manchester campus



Above: In the Polymer Colloids Lab at University of Manchester performing research.