1. Name

Jake Greenwood

2. Chemistry Faculty Research Director

Dr. Stephen Gross

3. Research Proposed (Please copy proposal into the box below this section. It will expand to include all text. The proposal is not to exceed 500 words and is not to exceed 2 pages. A summary of work already completed should also be included, if appropriate.)

Recent work in Dr. Gross’ laboratory has focused on the microencapsulation of therapeutic agents for use in oral healthcare.1-4 My research has focused on the microencapsulation of medical grade silicone oil. The plan is to then incorporate the microencapsulated medical grade silicone oil into polymers in order to create new composites with novel properties.

My preliminary research has demonstrated the feasibility to incorporate medical grade silicone oil. Through exploration of numerous synthetic conditions, I was able to microencapsulate medical grade silicone oil that had either a viscosity of 1000 cP or 12,5000 cP. An SEM depicting the synthesized microcapsules embedded in an acrylic polymer is seen below.
To date I have measured the flexural strength, fracture toughness and distance to failure of these novel composite materials as a function of microcapsule loading and silicone viscosity. These composites were prepared using urethane dimethacrylate continuous phases with loading up microcapsules between 0% (control) up to 20 w/w%. An example of the flexural strength data is shown below.

![Flexural Strength vs Percent Composition of 12,500 Silicone Microcapsules](image)

For the Baumann proposal, I propose to study the effect that these microcapsules would have on the adhesion of a dental composite to enamel. I plan to measure the shear bond strength of classic acrylate monomer systems loaded with the 1000 cP and 12,500 cP viscosity grade silicone polymers. Shear bond strength to intact bovine enamel will be determined by preparing bonded assemblies using an Ultradent fixture and loading to failure (1.0 mm/min) after 7 days of water storage at 37°C. The potential use of these materials in specific dental applications can be determined based on this study.

References


4. Plans for presentation of research results (conference, publication, seminar, etc.)

I applied to present in San Francisco in March at the International Association of Dental Research Convention, and we have plans to publish this work in the future as well.

5. Post-graduate plans (job market, graduate school, medical school, etc.)

I plan to attend graduate school to obtain my PhD in Organic Chemistry.

For the paper copy only – in addition to above, please include:

Social Security Number

__________________________________________
Applicant Signature

__________________________________________
Chemistry Research Director’s signature