

**INVESTIGATING THE POTENTIAL USE OF SBA-15  
FOR DRUG DELIVERY APPLICATIONS**

by

Justin Dane Siefker

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Approved by the  
Examining Committee:

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Marc-Olivier Coppens  
Thesis Adviser

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Pankaj Karande, Member

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Steven Cramer, Member

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Georges Belfort, Member

Rensselaer Polytechnic Institute  
Troy, New York

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## **ABSTRACT**

Over the last three decades there has been enormous growth in the field of biotechnology. This growth has created a wealth of knowledge ranging from the development of life saving protein therapeutics to the incorporation of enzymes in laundry detergent. Armed with a knowledge base as versatile as this, the unique opportunity to incorporate biotechnology with other fields becomes present. Merging the fields of biotechnology and nanotechnology provides great potential for new knowledge and novel applications to be developed. The use of bio-nanomaterials to aid in the delivery of protein therapeutic drugs is an application of significant interest.

These studies investigate the possibility of protection effects rendered by protein confinement inside the SBA-15 pore network. The protection effects evaluated are extreme pH, protease exposure, and exposure to sonication. For convenience myoglobin is chosen as the model protein for studies. The experiments were carried out using activity assays and a structural integrity assay to quantify the effects. At a cost of reduced maximum activity, myoglobin confined in SBA-15 had a down shifted and broadened range of activity. These studies also show complete myoglobin protection from the protease pepsin when confined in SBA-15, and reduction of denaturing upon exposure to sonication. These results reaffirm the significant potential of bio-nano therapeutics and encourage further investigation to develop a more fundamental understanding of bio-nanomaterial interactions.