Encapsulating Ibuprofen using Beeswax Microspheres

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Abstract
Beeswax is extremely versatile, often used in candles, lubricants. This compound is readily available and is not very expensive. We are interested in using beeswax as a biodegradable capsule to self-encapsulate drugs like ibuprofen.

Disciplines
Chemistry

Comments
Presented at the Science and Technology Alumni Hall of Fame Induction at St. John Fisher College in Rochester, NY, 2016.
Introduction

Beeswax is extremely versatile, often used in candles, lubricants. This compound is readily available and is not very expensive. We are interested in using beeswax as a biodegradable capsule to self-encapsulate drugs like ibuprofen.

Hypothesis

We hypothesize that beeswax will not react with ibuprofen and will effectively encapsulate the drug.

Methods

Method 1 - Water bath
Beeswax sample was prepared by melting 5.0 g of beeswax in a hot water bath at 90°C. A hot mixture (90°C) of 50.0 mL distilled water and 20 drops of soap was added along with 0.4 g. The mixture was stirred with a magnetic bar at 1000 rpm for 30 min.

Method 2 - Pot
Beeswax (5.0 g) and ibuprofen (0.8 g) were melted together in a pot and a hot mixture of 50.0 mL distilled water and 20 drops of soap was added. The mixture was stirred for 30 sec by a hand mixer on the hot plate, was removed from the heat to stir for the remainder of 5 min.

The evaluation of drug encapsulation is assisted by digital microscopy (10-60X), Scanning Electron Microscopy (SEM, 30-500X), UV-Vis and IR spectroscopy.

Discussion and Conclusion

• SEM and LCD microscope analysis of beeswax samples suggested that possible encapsulation of ibuprofen is occurring to a various extent depending on the sample preparation method.
• In both methods, UV-Vis spectra confirmed the presence of both beeswax and ibuprofen in all samples. The peak at 250-275 nm indicates the presence of ibuprofen, and the peak at 280-300 nm indicates the presence of beeswax.
• LCD microscope shows microspheres of varying sizes. Some spheres were notably larger than the others, which might suggest the encapsulation of ibuprofen by those spheres had happened. Ibuprofen crystals were still visible in the samples as shown in Figure 4b and 4d.
• Method 1’s SEM images shows no visible ibuprofen rods. Some ibuprofen rods in method 2 sample were still visible on the surface or protruding out of the beeswax microspheres. The size of some beeswax microspheres in sample of method 2 was at least three times the size of the microspheres in method 1’s sample, as shown in Figure 5b and 5d. This might indicate that method 2 is a more efficient way encapsulate ibuprofen.

Future Work

More studies will be conducted to determine the factor(s), such as stirring time, temperature, and methods of preparation, that contributed to encapsulation efficiency.

Acknowledgments

Special thanks to St. John Fisher College’s Chemistry Department and Summer Fellow Program for this opportunity and their funding. Hongtao Li for his contributions to this research. Brian McIntyre at University of Rochester for doing our SEM sample analysis. Dr. Yajaira Sierra-Sastre for her contributions on the experimental procedure.

References