

Production of pectin-oligochitosan beads

Encapsulator B-390 / B-395 Pro: Production of pectin-oligochitosan microbeads in two different shapes

1. Introduction

The Encapsulator B-390 / B-395 Pro is widely applied in a single-step process for the encapsulation of drugs, flavor & fragrances, pigments, nutrition supplements as well as microorganisms. Alginate is often the matrix material of choice due to its availability and good bead forming properties.

This Short Note describes the use of pectin as matrix material. Pectin is a biodegradable and biocompatible polymer from natural source.

Chelation with oligochitosan enables to use pectin with the Encapsulator for bead manufacturing.

Here, the protocol and required steps for pectin-oligochitosan microbead formation is presented. Such alginate-free microbeads show excellent capability for drug delivery applications [1].

2. Experimental

Equipment:

Encapsulator B-390 / B-395 Pro

Chemicals:

Low-methyl pectin (order code: P9135) was purchased from Sigma Aldrich (St. Louis, USA); Esterification: 26 %; MW: 30.03 kDa; CAS Number: 9000-69-5

Oligochitosan (food grade) was obtained from Zhejiang Golden-Shell Pharmaceutical Co. Ltd (Zhejiang, China); Appearance: Yellow powder; MW: 2000 Da; CAS Number: 148411-57-8

Both aqueous solutions, 3 % (w/v) pectin and 5 % (w/v) oligochitosan, were prepared using a magnetic stirrer.

Table 1: Encapsulator process settings

Nozzle set	Single-flow nozzle; 150 μm
Feeding	Syringe pump
Feed rate	4 mL/min
Vibration frequency	2000 Hz
Electrode tension	2000 V
Amplitude	9
Hardening bath	Oligochitosan solution
Stirring	Gentle* / strong** stirring

* hardening bath solution with no vortex

** hardening bath solution with vortex. The shearing force induced the spherical liquid droplet to change the shape.

3. Results



Figure 1: Light microscope image at $10\times$ displaying spherical pectin-oligochitosan microbeads with a size of $500 \pm 20 \mu\text{m}$. Hardening bath gently stirred.



Figure 2: Light microscope image at $10\times$ displaying egg shaped pectin-oligochitosan microbeads. Hardening bath strongly stirred.

4. Conclusion

The BUCHI Encapsulator B-390 / B-395 Pro is able to produce pectin-oligochitosan microbeads, which are well suited for drug delivery applications.

By variation of the stirring speed of the hardening bath, two types of morphologies, spherical and egg shaped, are obtained.

The diameter of the spherical shape microbeads was about $500 \mu\text{m}$. By choosing a larger nozzle orifice, microbeads up to several mm is possible.

5. Reference

[1] James Z. Crouse, Kirsten M. Mahuta, et al. 2015. Journal of Applied Biomaterials & Functional Materials 13:e326-e311.