

Mesocapsules for Agrichemical Delivery

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Introduction:

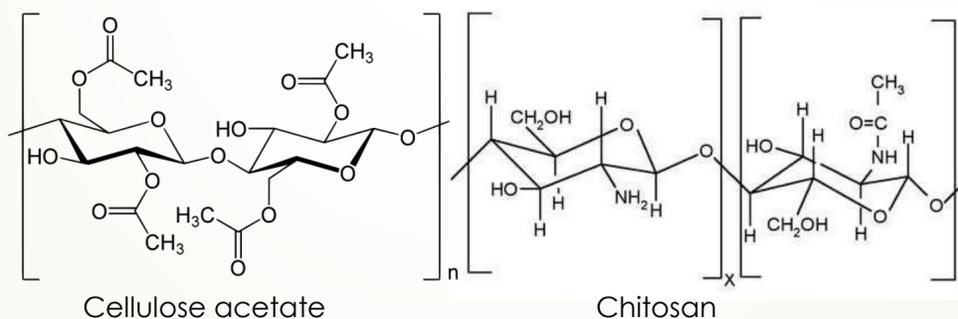
Wood used as building materials is often attacked by termites and fungi reducing its structural integrity. Minimising this damage is important, and current methods cannot effectively prevent this. A potential solution would be to introduce a poisonous agrichemical into the wood-glue. The agrichemical needs to be encapsulated in order to be effective.

The aim of this project was to investigate the process of interfacial polymerisation to encapsulate the agrichemical, described in the diagrams below. The process involves the reaction of a diisocyanate with an amine at the interface of particles produced in an oil-water emulsion. A further goal was to maximise the incorporation of cellulosic materials into the polymer wall.

Cellulose Derivative Incorporation:

Cellulose acetate was trialled for incorporation onto the particles' surface, by dissolving into the water phase. This is a biodegradable polymer and acts as bait for the pests. After consuming the shell the pests ingest the agrichemical and die.

Another cellulose derivative, chitosan, was incorporated in a separate experiment because it can potentially bind better to the particle surface. The structure of both derivatives is shown below.



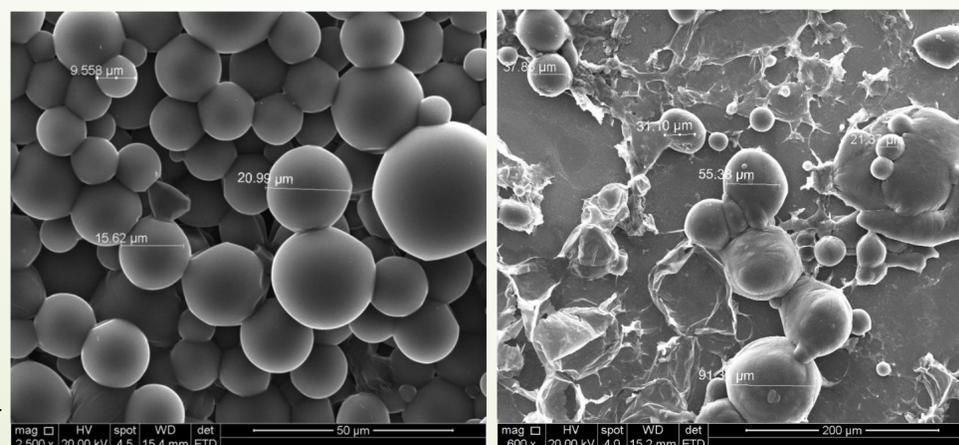
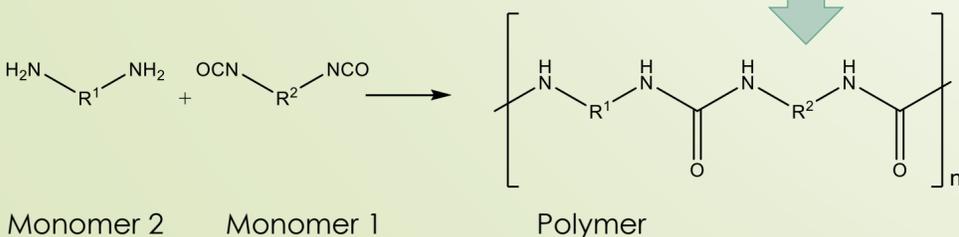
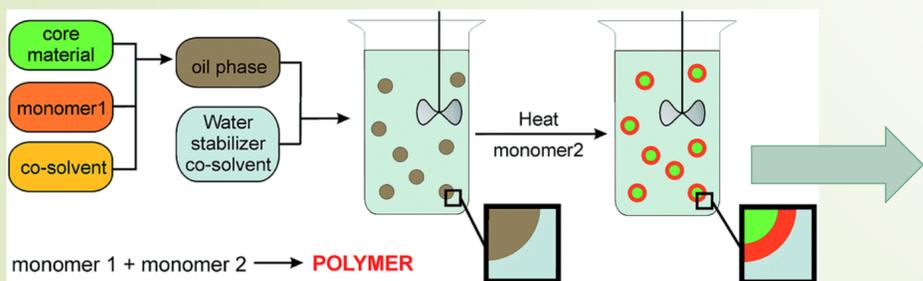
Results and Conclusion:

The particles were successfully synthesised using the method shown in the flow chart below.

Chitosan causes the morphology of the particles to change, which suggests the particles are not forming properly. However, this does not disprove the method.

In contrast, when cellulose acetate was used, discrete particles were formed, suggesting the particles were formed properly. This was supported by a number of spectroscopic techniques.

It can be concluded that cellulose derivatives can be effectively incorporated onto the surface of these particles.



Particles (no additives)

Particles (Cellulose acetate)

