Preparation and Characterisation of Calcium Shellac Microparticles

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Shellac has the features of low water permeability and excellent film forming properties. It is enteric and listed as a food additive. Traditionally, shellac aqueous formulation has been used to coat confectionary, nuts, fresh fruits, nutritional supplements and pharmaceutical products based on fluidized bed coating (1). Previous work has demonstrated that calcium shellac beads (~1mm in diameter) can be produced by reacting aqueous solution of shellac (ammonium salt of shellac) with calcium chloride using extrusion (2). In this work, calcium shellac microparticles were prepared using a method of external gelation. The sizes of the prepared microparticles were in the range of 10-100μm, depending on the agitation speed used in the gelation process. The morphologies of calcium-shellac microparticles were characterized using scanning electron microscopy (SEM). The inner structure of the microparticles was evaluated using X-ray micro-computed tomography (3). The mechanical strength of these microparticles has been determined by a micromanipulation technique (4). The brief summary of the results are as follows.

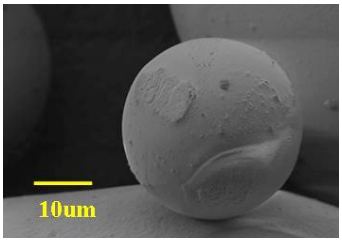

Fig 1.The SEM image of a calcium-shellac microsphere.

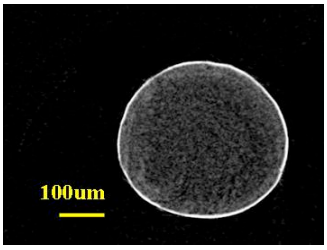

Fig 2. The X-ray image of a freeze dried calcium-shellac microsphere.

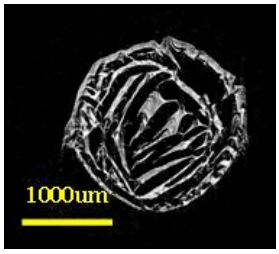

Fig 3 The X-ray image of a freeze dried calcium-shellac bead made by extrusion for comparison (2).

Mean Diameter (μm)	Rupture Force (mN)	Norminal Rupture Stress (MPa)	Deformation at Rupture (%)
39.7±2.9	25.9 ±3.6	19.7±1.5	17.9± 0.8

Table 1. Mechanical property parameters of calcium shellac microspheres.

In conclusion, calcium-shellac microspheres have been successfully produced using a method of external gelation. The inner structure of the microspheres made by external gelation was more condensed than that of calcium-shellac beads by extrusion, and consequently the former were much stronger. It is believed that calcium-shellac particles with controllable structural and mechanical properties can be used to encapsulate active ingredients relevant to different industrial applications.

References:

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