Oxidized starch polymer(OSP)microgels for encapsulation and controlled release of functional ingredients

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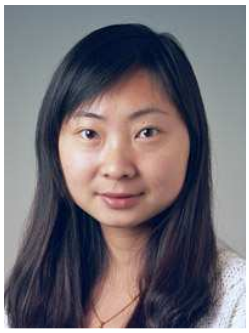

Introduction

Microgels are widely used in fields such as drug delivery carriers and coating of functional ingredients. Microgels from natural polymers draw more attention nowadays for food and biomedicine, because of their biodegradability.

Most recently, we have developed a biopolymer-based release-on-demand BioSwitch microgel, constituted of cross-linked negatively charged potato starch polymers, which electrostatically interact with charged compounds (Fig.1a). Furthermore, the advantages of Bioswitch microgel are that the electrical charge density, and the cross-linking density can be controlled by selecting preparation conditions. This yields microgel endowed with controlled swelling and uptake capacity. Since the microgels are responsive to environmental changes, such as pH and salt concentration, controlled uptake and release of functional ingredients inside the gels can be tuned.

The microgel was chemically cross-linked by sodium trimetaphosphate (STMP) at various cross-linking density and oxidized to different degrees (degree of oxidation,DO%,30%,50%,70% and 100%).

Industrial applications of OSP microgels

Our starch microgel has shown to absorb lysozyme below its isoelectric point, where the overall charge of the protein and gel have opposite signs. Such lysozyme-contained system has great potential for antimicrobial food packaging. Exposing lysozyme-containing starch particles to a microbially contaminated environment leads to hydrolysis of the starch by microbial enzymes. As a result, lysozyme is released in the environment where it inhibits microbial growth. (Fig. 1 b)

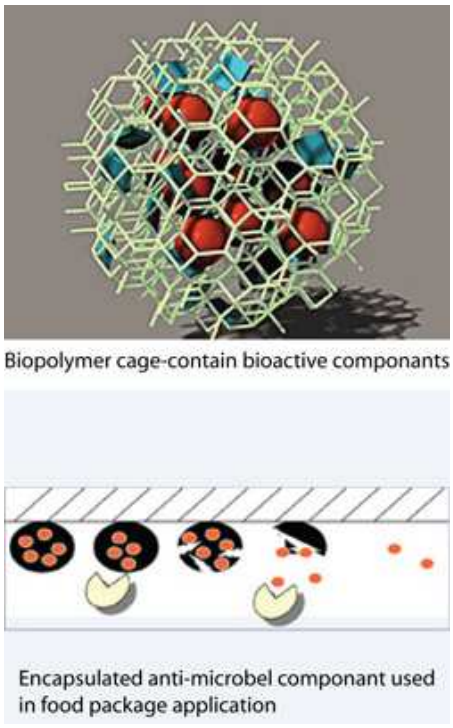

Figure 1a.Biopolymer cage-contained bioactive componants 1b Encapsulated anti-microbe component used in food package application

Research focus

In my research, physico-chemical parameters are varied in a controlled way over a wide range of conditions. This will yield accurate systematic data that add to the academic knowledge of protein-(charged) gel interaction as well as to the understanding of how to choose optimum conditions for application in release-on-command systems.