

Immobilization of Trypsin on Silk Protein Fiber

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The hot-water extracted sericin solution forms a gel at its high concentration and its solubility decreases greatly during lyophilization. These are main drawbacks that prevent the use of sericin in many fields such as foods and cosmetics. To prevent the gelation of sericin solution, salts are added in order to change ionic strength in the solution. By adding salts, the gelation time was prolonged but it could not prevent the gelation permanently. The solubility of lyophilized sericin shows its maximum at high pH, high ionic strength and high temperature. But these conditions are not suitable for common use of silk sericin. To enhance the solubility of lyophilized sericin at neutral pH and room temperature, lyoprotectants are added during lyophilization. Although the lyoprotectants successfully replaced the water molecules surrounding sericin, the solubility of sericin could not be enhanced dramatically. The gelation and decrease of solubility of sericin is due to its high molecular weight. To reduce the molecular weight of sericin, immobilized enzyme systems are used. Proteolytic enzymes are immobilized directly on the silk fiber and it is compared with common synthetic fiber, polyester and nylon. Silk fiber showed the best results among these fibers. To enhance the activity of enzyme toward high molecular weight substrates such as sericin, some spacers are introduced. Ethylenediamine and hexadecylamine were introduced as low molecular spacers, and BSA and sericin were introduced as high molecular spacers. In case of low molecular spacers, only ethylenediamine showed better enzyme activity but both spacers have poor enzyme stability. In case of high molecular spacers, sericin shows better results than BSA. Because of its high -OH content, sericin is a hydrophilic spacer which stabilizes the enzyme against denaturation. To immobilize the enzyme on sericin, sericin fixed fibers are used. As a result, the stability of enzyme is

enhanced especially against the organic solvents. Using polyester fiber and sericin fixed fiber as immobilization support, trypsin and α -chymotrypsin are immobilized to reduce the molecular weight of sericin. Sericin was successfully hydrolyzed with immobilized enzymes and the solubility was enhanced dramatically. And also no gelation was observed even at high concentration of sericin solution.