

## Development of Desalination and Concentration Process of Protein Solutions with Superabsorbent Hydrogels

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### Summary

It is generally recognized that separation processes of proteinaceous solutions play a vital role in the fields of biotechnology, biomedicine, and food processing. In this separation process, there is a real need for simultaneous operation of concentration and desalination of protein solutions. Traditionally, a wide variety of separation techniques are used for concentrating the dilute protein solutions. One promising technique involves the use of superabsorbent hydrogels. In the technique, dry gel particles are added to a dilute aqueous solution containing protein molecules. This method does not require any special device, and it is especially effective for the concentration of labile solutes such as proteins because it is a mild operation.

We quantitatively investigated a process for desalinating and concentrating bovine serum albumin (BSA) in potassium chloride solution by multi-stage operation with superabsorbent-crosslinked hydrogels. The process employs swelling of gel particles by the absorption of water and salt with exclusion of protein molecules. In the two-stage operation, the concentrated solution was diluted with water, and then other gels were added to the diluted solution in order to further concentrate the protein. As a result, the solution was effectively desalinated and concentrated with the superabsorbent hydrogels. Moreover, when the three-stage operation was executed, the dilution ratio of potassium chloride and the concentration ratio of BSA became 0.15 and 5.1 times, respectively. It was also shown that the characteristics of desalination and concentration of a protein solution by multi-stage operations are well expressed by the swelling behavior of superabsorbent hydrogels for a variety of salt concentrations.

In conclusion, it is clarified that effective desalination and concentration of protein solutions with superabsorbent hydrogels could be realized by multi-stage operations.