

Study on an Effect of Salts on Protein Crystallization

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Summary

A structure analysis of proteins provides fundamental and useful information for the research on biochemistry and life science and for the development of new medicines. The protein crystallography needs good crystals for suitable to x-ray or neutron diffraction. However, crystallization of proteins is a bottleneck because the crystallization is a try and error procedure and requires considerable experimental efforts.

We have found that a forward light scattering at small angles is highly sensitive to aggregations and crystal nucleus formation of proteins in crystallizing protein solutions. We here studied an effect of precipitant salts of NaCl, KCl, MgCl₂ and CaCl₂ with a chlorine ion on the protein crystallization, using a forward light scattering technique. Hen egg white lysozyme (HEWL) was used for a model protein of crystallization in this study. The properties of forward static light scattering (F-SLS) depended on a concentration of precipitant salts added to the HEWL solutions. The HEWL solutions showed the F-SLS patterns to be non-integer power law at more than a certain concentration of salts. This indicates that the HEWL proteins form a fractal aggregate with added salts before crystallization. We evaluated relationships between the crystallization conditions with salts and the F-SLS of the solutions in pre-crystallization. The F-SLS characteristics of the HEWL solutions progressing to crystallization exhibited a formation of the protein aggregates of relatively high density.