Poster Presentation

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A new approach to ordered protein films formation

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The protein films formation on solid substrates arouse considerable interest both to study proteins functioning mechanisms and to use it in building hybrid systems. Up to date many important peculiarities of protein film growth were investigated, but still there is no technology of controlling protein films formation on solid substrates.

In the present report, we developed new approach based on recently opened by us phenomena of cluster with unit cell structure formation. In previous studies on tetragonal lysozyme, it was shown that the addition of the precipitant (NaCl) to a lysozyme solution under the crystallization conditions (certain concentration of protein and precipitant, pH, buffer composition and temperature) leads to the process of the oligomers formation [1, 2]. In this case, about 10% of octamers could be formed and thought to be directly involved in crystal growth.

We modified Langmuir-Schaefer technique (Fig.1) by using of the protein solution with precipitant addition for monolayer formation. The addition of precipitant provides oligomers organization (octamers in this case), the presence of which may affect the structure of the resulting film.

The clear correlation between initial conditions of lysozyme solutions and quality of lysozyme Langmuir-Schaefer films was experimentally established by X-ray standing waves in the total external reflection [3], X-ray reflectometry and Atomic force microscopy data. With the crystallization conditions of initial solution, big square uniform films with high electron density and 6 nm thickness (two molecule size) were grown. Under non-crystallization initial condition when protein solution contains only monomers, islands-like films with 3 nm (one molecule size) thickness were derived.

By independent methods, we demonstrated that the Langmuir monolayer formed and transferred onto the substrate inherits the properties of the crystallization solution – the cooperation lysozyme molecules into ordered octamers. The proposed modification of the Langmuir-Schaefer technique allows to obtain close-packed, continuous, homogeneous protein films and opens very promising approach for hybrid systems development.

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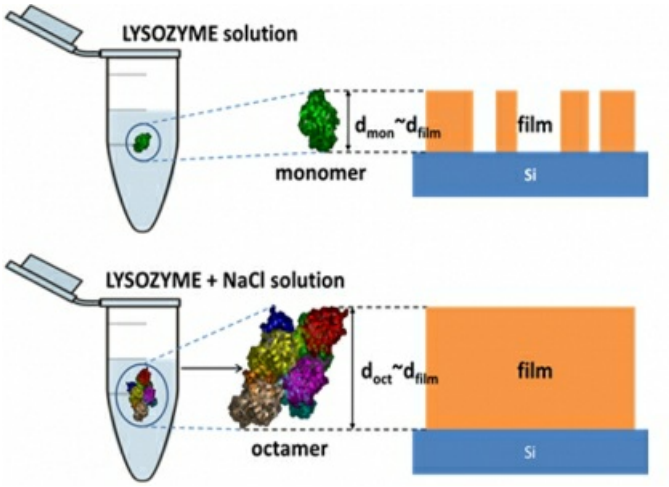

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