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研究论文

第一类鱼抗冻蛋白对冰晶生长界面层结构的影响

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摘要：

根据冰晶在水溶液中生长的基本热力学性质，应用多层界面模型，分别得到了冰晶在纯水及抗冻蛋白溶液中生长界面层的吉布斯自由能。由冰晶生长界面层的吉布斯自由能，分析了冰晶在三种不同第一类鱼抗冻蛋白分子溶液中，热平衡状态下生长界面层的微观平衡结构，发现冰晶在抗冻蛋白溶液中生长与其在纯水中生长相比，界面层结构有明显变化，结合抗冻蛋白后，冰晶的生长界面由粗糙界面向光滑界面转变；并讨论了结合抗冻蛋白后，冰晶生长界面层微观平衡结构的变化对冰晶生长形态的影响。为理解冰晶在抗冻蛋白溶液及纯水中有不同的生长习性和生长形态这一实验事实，提供了理论依据。

关键词： 冰晶 抗冻蛋白 界面层结构

The Effect of Type I Antifreeze Proteins on The Equilibrium Structure of Interfacial Layer of Ice Crystal

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Abstract:

Based on the thermodynamic properties of ice crystal in aqueous solution and using multilayer model, Gibbs functions of interfacial layer of ice crystal in pure water and antifreeze protein solution were obtained respectively. Equilibrium structures of interfacial layer of ice crystal in three kinds of type I antifreeze protein solution were analyzed by using the Gibbs function. Equilibrium structures of interfacial layer of ice crystal in pure water and antifreeze protein solution were different. The effect on the shape of ice crystal that caused by change of equilibrium structure of interfacial layer of ice crystal was discussed. It is a theoretical evidence for understanding the experiment results that the growth habits and shape of ice crystals are different in antifreeze protein solution and pure water.

Keywords: Ice crystal Antifreeze protein Equilibrium structure of interface layer

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