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Mechanisms of function by AF(G)Ps in ice crystal growth prevention, modification and recrystallization

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Antifreeze activity by proteins and glycoproteins is a form of biomineralization process. Contrasting to covalent or ionic crystals, these hydrogen-bonded molecular crystals (ice) have much weaker crystalline bonding energy profiles. Thus, when interacting with proteins that are equally easy to change in conformation by variations of the hydrophilic/hydrophobic environment, some unique findings are suggestive that local conditions play significant roles in the activity level of these proteins or glycoproteins as they affect ice crystal growth, modification and recrystallization. We review some of these experiments and provide ideas for their functioning mechanisms.