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Investigation of Ice-Binding Proteins using Heterodyne-Detected Vibrational Sum-Frequency Generation Spectroscopy

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Antifreeze proteins (AFPs) and Antifreeze Glycoproteins (AFGPs) collectively abbreviated as AF(G)Ps are a unique class of proteins that modify ice crystal growth and enable the survival of organism in freezing and subfreezing habitats. The molecular working mechanism behind AF(G)Ps freezing inhibition is not well understood, because, as yet, there are few experimental techniques that allow obtaining molecular details on how antifreeze proteins function directly at the surface of ice. Here we use surface specific heterodyne-detected vibrational sum-frequency generation spectroscopy (HD-VSFG) to study the properties of antifreeze proteins directly at the ice surface and at the molecular level.

Significance statement

Antifreeze proteins (AFPs) and Antifreeze Glycoproteins (AFGPs) collectively abbreviated as AF(G)Ps are a unique class of proteins that modify ice crystal growth and enable the survival of organism in freezing and subfreezing habitats.

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