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Self-oscillatory ice crystal growth in antifreeze protein (AFP) and glycoprotein (AFGP) solutions SALVADOR ZEPEDA, HIROYUKI NAKAYA, YUKIHIRO UDA, Hokkaido University, ETSURO YOKOYAMA, Gakushuin University, YOSHINORI FURUKAWA, Hokkaido University — AFPs and AFGPs allow many organisms including fish, plants and insects to survive sub-freezing environments. They occur in a wide range of compositions and structure, but to some extent they all accomplish the same functions: they suppress the freezing temperature, inhibit recrystallization, and modify ice crystal growth. A complete description of the AFGP/AFP surface mechanism as well as other ice surface phenomenon has eluded scientists primarily due to a lack of direct surface studies. We study ice crystal growth in AFGP and AFP solutions with phase contrast microscopy during free solution growth under various conditions including microgravity. Free-solution growth experiments show an anisotropic self-oscillatory growth mode of the steps and interface near the freezing temperature and enhancement of the growth rates in the c-axis. These results contradict the previous ?tight-binding? mechanism thought to be responsible for antifreeze function. To study the effects of temperature driven convective flows on the interface kinetics, microgravity experiments were performed in a jet airplane during a parabolic flight path. Step propagation on the basal plane slows down considerably when entering the microgravity condition and reaches a critical condition just below 0.2g.

Salvador Zepeda
Hokkaido University

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