Antifreeze to improve aeroplanes, ice cream and organ transplants

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The design of aeroplane wings and storing organs for transplant could both become safer and more effective, thanks to a synthetic antifreeze which prevents the growth of ice crystals, developed by researchers at the University of Warwick.

Taking inspiration from Antifreeze Proteins (AFPs) which occur in nature, researchers from the Department of Chemistry and Warwick Medical School have developed iron-based synthetic imitations, which have been shown to slow to growth of ice crystals.

The researchers suggest that these antifreeze properties are a result of the iron complex containing separated regions with water-loving and water-hating characteristics, which mimics the properties observed in AFPs.

AFPs exist naturally in a variety of animals that live in the most extreme environments on earth - such as Artic fish, which can use AFPs to stop their blood from freezing in sub-zero conditions.

The ability to prevent the growth of ice crystals could be of huge technological importance across a range of applications, from the protection of aeroplane wings and wind turbines from ice-damage, to making ice cream smoother or safely freezing human tissue for transplantation.

"Some of these were found to be very potent at stopping ice growing, a

rare property normally only associated with antifreeze proteins," explains lead researcher Professor Matthew Gibson.

"The versatile synthetic and adaptable nature of these compounds will let us fine-tune the structure to both understand the ice/water interface and develop new inhibitors for (bio)technological applications," he continues.

The research, 'Antifreeze Protein Mimetic Metallohelices with Potent Ice Recrystallization Inhibition Activity' is published in the *Journal of the American Chemical Society*.

More information: Daniel E. Mitchell et al. Antifreeze Protein Mimetic Metallohelices with Potent Ice Recrystallization Inhibition Activity, *Journal of the American Chemical Society* (2017). DOI: 10.1021/jacs.7b05822

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