

Abstract Submitted
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Bioinspired Antifreeze Secreting Frost-Responsive Pagophobic Coatings¹ XIAODA SUN, VIRAJ DAMLE, KONRAD RYKACZEWSKI, Arizona State University — Prevention of ice and frost accumulation is of interest to transportation, power generation, and agriculture industries. Superhydrophobic and lubricant impregnated pagophobic coatings have been proposed, however, they both fail in frosting conditions [1, 2]. Inspired by functional liquid secretion in natural systems, such as toxin secretion by poison dart frog in response to predator presence, we developed frost-responsive antifreeze secreting pagophobic coatings. These are bilayered coatings with an inner superhydrophilic “dermis” infused with antifreeze and an outer permeable superhydrophobic “epidermis.” The superhydrophobic epidermis separates the antifreeze from the environment and prevents ice accumulation by repelling impinging water droplets. In frosting conditions, the antifreeze is secreted from the dermis through pores in the epidermis either due to contact with condensed droplets or temporary switch of the epidermis wettability from hydrophobic to hydrophilic caused by surface icing. Here we demonstrate superior performance of this multifunctional coating in simulated frosting, freezing mist/fog, and freezing spray/rain conditions.

[1] Varanasi et al., *App. Phys. Lett.*, 97, 2010.

[2] Rykaczewski et al., *Langmuir*, 29, 2013.

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Konrad Rykaczewski
Arizona State University

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