

# Ice is no match for CSU-developed coating

November 17 2016, by Anne Ju Manning

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Credit: Colorado State University

Anyone who's ever chipped ice off a windshield or nervously watched a plane get de-iced, take note: Colorado State University researchers have invented an ice-repellent coating that out-performs today's best de-icing products.

Researchers led by Arun Kota, assistant professor of mechanical engineering and biomedical engineering, have created an environmentally friendly, inexpensive, long-lasting [coating](#) that could keep everything from cars and ships to planes and power lines ice-free.

Their innovation, described in the *Journal of Materials Chemistry*, is a gel-based, soft coating made out of PDMS (polydimethylsiloxane), a silicone polymer gel with already widespread industrial use. Their experiments were supported by careful analysis of ice adhesion mechanics.

The performance measure of de-icing coatings is called ice [adhesion strength](#) - the shear stress necessary to remove ice from a surface - and is measured in kilopascals (kPa). Kota's group demonstrated ice adhesion strength for their coating of about 5 kPa. By contrast, soft coatings available on the market have ice adhesion strength of about 40 kPa (lower is better). Other types of de-icing coatings made of rigid materials like Teflon typically perform at around 100 kPa.

And what about what's sprayed on frozen planes before takeoff? Those are liquid de-icers, including ethylene glycol or propylene glycol, and they work pretty well. The spraying of salts or glycols is the most common passive de-icing technique used today; according to the EPA, more than 20 million gallons of de-icing chemicals are used per year by the aviation industry alone. But these liquid products leach into groundwater, raising environmental concerns. And they have to be applied over and over again.

Kota notes that de-icing coatings are not the same as anti-icing coatings. Anti-icers delay the formation of ice; de-icers facilitate easy removal of ice, once that ice has already formed and stuck to a surface.

The CSU breakthrough is an environmentally friendly, high-performance solution that could rid us of toxic liquid de-icers and keep ice from sticking to our windshields. It would be applied as a more permanent protective coating.

"We think there is significant commercial potential here," Kota said.

**More information:** Darryl L. Beemer et al, Durable gels with ultra-low adhesion to ice, *J. Mater. Chem. A* (2016). [DOI: 10.1039/C6TA07262C](https://doi.org/10.1039/C6TA07262C)

Provided by Colorado State University

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