How I turned my kitchen in a lab during the pandemic and its (non-)icy outcomes

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In the past two years, the national lockdowns and the unusual working conditions that came with the Covid-19 pandemic, have dramatically impacted the life of researchers. In the case of experimentalists, whose job cannot be fully done remotely, the impossibility to physically access laboratory and other facilities meant a slower pace of data production and testing.
While many took this opportunity to perform other tasks – such as writing, organizing future work, and studying –, a serendipitous encounter with an improbable manuscript about ice adhesion, inspired me in trying a new idea and convinced me to set up a small laboratory in my house to develop my own homemade anti-icing solution.

In particular, with the help of colleagues, we developed and characterized a series of slippery lubricant-infused porous surfaces (SLIPSs) realized by impregnating with silicone oil a candle soot layer deposited on double-sided 3M adhesive tape. These former consists of highly porous nanostructured materials where a lubricant fills the cavities and covers the surface, resulting in an interface which can be considered liquid and that prevents the adhesion of different materials. Capillary forces hold the lubricant in place and the porosity of the material act as a reservoir.

Despite the use of common household items, these SLIPSs showed anti-icing performance comparable to other systems described in the literature (ice adhesion < 20 kPa) and a good resistance to mechanical and environmental damages.
Moreover, the use of a flexible and functional substrate as tape allowed these devices to be stretchable without suffering significant degradation and highlights how these systems can be easily prepared and applied anywhere needed. The stretching and bending also provides an extremely efficient way to deliver the force necessary to detach the ice, showing the good performances of flexible SLIPS as actual mechanical ice removal technology.

Figure 1. Cartoon showing the working principle and the fabrication procedure of SLIPS on tape.