# An intrinsic, self-healing and recyclable material with super low ice adhesion force achieved by Poly-Silicon-urea.

Jun Chen[1], Pär Marklund[1], Marcus. Björling[1], Yijun. Shi[1]*

[1]Luleå university of technology, Lulea 97187, Sweden

Excessive ice accretion leads to economic losses and acts as a potential hazard to humans and animals. Passive de-icing technologies have attracted more attention compared with active de-icing technologies, mainly due to the passive de-icing systems lower energy consumption and sustainability. Some reported materials reach high de-icing efficiency, but the service life and de-icing performance are usually short due to mechanical wear. Here, we investigate self-healing functional materials that can overcome the above problems. We prepared an intrinsic, self-healable and recyclable material with ultra-low ice adhesion force, made possible by introducing dynamic disulfide bonds in the hard phase of silicone-based materials. With 7±1kPa ice adhesion force and close to 99% self-healing efficiency, this recyclable poly silicone urea can be used in several practical applications. Our results do not only enable sustainable de-icing, but also increase the amount of possible practical applications for de-icing materials.

**Keywords:** Anti-icing/De-icing, Mechanical wear, Self-healing, Recyclable, Ploy-silicon-urea polymer.

*Corresponding author: yijun.shi@ltu.se