Understanding of Ice Nucleation and Adhesion on Particle-based Amphiphilic Surfaces

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Ice formation on aircrafts, wind turbines, as well as power lines cause several problems. It leads to breakdowns of the energy supply or causes dangerous accidents. [1, 2] Thus, it is of crucial importance to develop multifunctional polymeric materials that prevent ice formation, reduce unnecessary expenses and decrease the number of accidents. A combination of anti-icing and de-icing properties in one material is a very challenging task and requires the control of several parameters such as ice nucleation, growth and ice adhesion. [1, 2]

The development of amphiphilic materials allows a combination of the advantages of different ice preventing strategies. Therefore, two approaches are presented for the design of heterogeneous surfaces (Fig. 1) which have anti-icing and de-icing capabilities. These surfaces are based on polymer-modified hybrid core-shell particles. The first system is based on a mixture of different types of particles with controlled and tuneable chemical composition in various ratios. The second system is made of hybrid polymer-modified Janus particles. [1, 2, 3] These surfaces are based on different polymer-modified hybrid core-shell particles. The first system is based on a mixture of different types of particles with controlled and tuneable chemical composition in various ratios to form heterogeneous surfaces. The second system is based on heterogeneous surfaces made of hybrid polymer-modified Janus particles. [2]

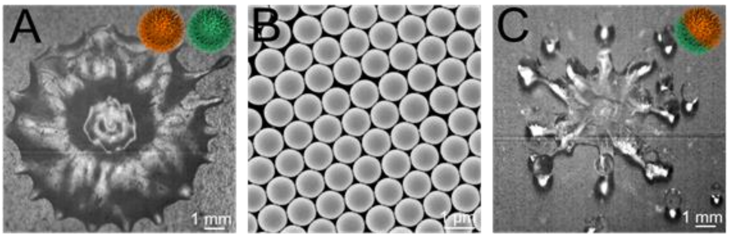

Figure 1. A) Representative optical image of the impact of a supercooled water droplet on a surface based on a mixture of two different particle types, B) SEM image of a particle-based surface, C) representative optical image of the impact of a supercooled water drop on a surface based on Janus particles.

[1] A Kirillova, C Marschelke, and A Synytska, *Chem. Mater.*, **28** (2016), 6995.
[2] M Schwarzer, T Otto, M Schremb, C Marschelke, H Tee, F Wurm, I Roisman, C Tropea, A Synytska, *Chem. Mater.*, **31** (2019), 112.
[3] M Schwarzer, T Otto, and A Synytska, under preparation.

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