Vestas

Passive blade ice protection using icephobic surfaces and paints

Student Project Proposal

APPLY

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Background

Wind Turbines are getting more and more efficient thanks to the advance in materials and novel engineering solutions. However, to ensure optimal production of energy the blades must perform in all weather conditions. This is particularly challenging in cold climates where ice can accumulate in the blades, resulting in a huge degradation of the aerodynamical performance. To mitigate this problem, a relatively simple solution may be based on an icephobic coating in the wind turbine blade, which can be based on a paint or on a textured surface. Over the years much work has been done by academic institutes and private companies to research and develop such coatings, but typically is difficult to assess if they will perform as well in the field as they perform in lab conditions.

Scope

The aim of this project covers the study of the state-of-the-art of icephobic, and superhydrophobic, coatings that can be applied to wind turbine blades, including:
- A deep literature review to identify what has been done so far in the field.
- A downselection of the best solutions based on their potential real application to a wind turbine, which should be based on the assessment of:
    - Ice phobicity;
    - testing environment conditions close to field conditions;
    - durability;
    - resistance to contaminants;
    - aerodynamic smoothness;
    - cost

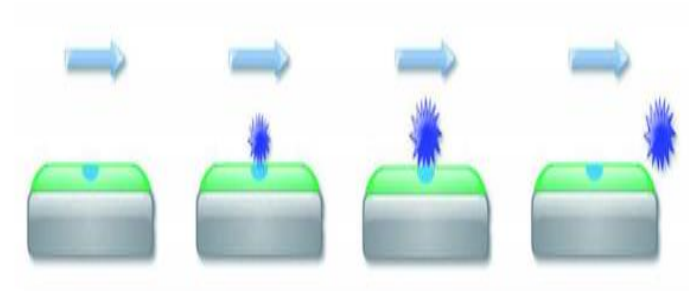## Keywords:
Wind turbines; Icephobic surfaces

Image from: dtu.dk

Icephobic coatings do not repel water droplets, but permit ice to form albeit with a very low surface shear stress; i.e. accumulated ice removal is due to gravity or aerodynamic agitation due to rotating action of the blade