EIROS

ADVANCED ICE AND EROSION RESISTANT COMPOSITES

EIROS project

Advanced ice and erosion resistant composite materials

WinterWind 2018

5th to 7th of February 2018

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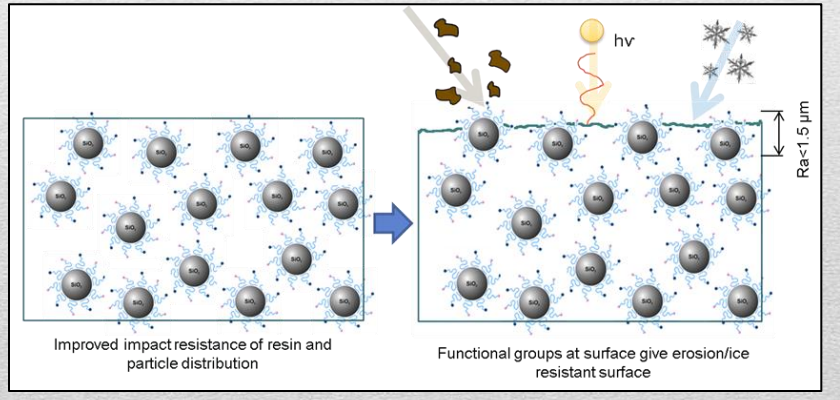
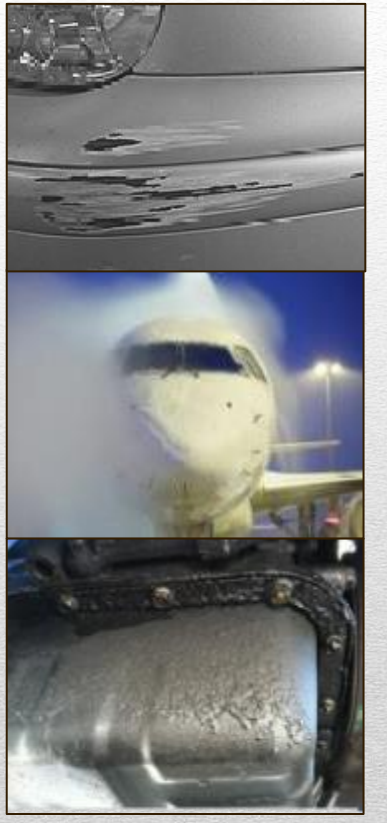
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 685842.

EIROS project concept

Development of a high performance composite material by incorporating innovative additives into the composite bulk matrix for operation in extreme environments

- ✓ Increased erosion resistance
- ✓ Anti-icing characteristics
- ✓ Self-healing properties





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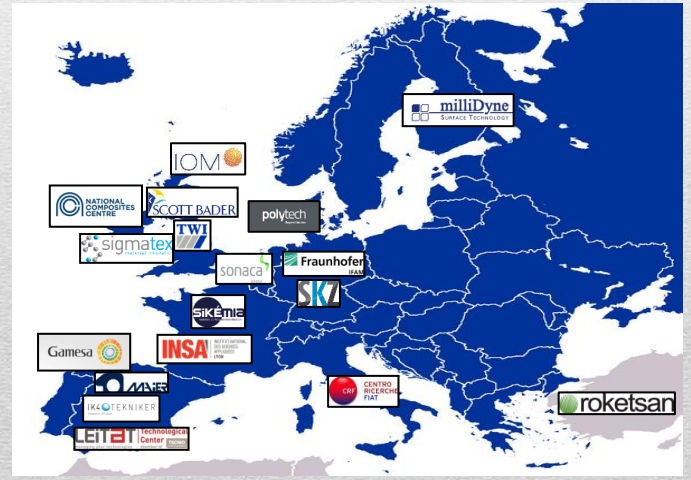
EIROS in numbers

"Advanced ice and erosion resistant composite materials for diverse applications"

EIROS

- **Competition:** NMP19 – 2015 'Materials for severe operating conditions, including added-value functionalities'
- **Duration:** 3 years
- **Total budget:** EUR 8 millions
- **Consortium:** 18 partners from 9 European countries
- **Starting date:** March 2016



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Scientific and Technological objectives

- **To develop new functional materials:**
  - To optimise the processing parameters (loading levels of >50% of additives)
  - Scaling-up process methodology
  - Materials-by-design approach
  - Advanced resin suitable for fibre reinforced composite manufacturing process
- **To develop advanced composite structures:**
  - Functional properties: self-healing, ice repellency, erosion resistance, thermal and UV exposure resistance,
  - Retention of functionalities: compressive strength, tensile strength, impact, water absorption
- **To establish a multiscale modelling approach**

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EIROS – Materials development approach

ADDITIVES

- **Development & Synthesis**
- **Optimisation**
- **Lab scaled up**
- **Characterisation**

Functionalised Silica nanoparticles for hydrophobicity

Self-healing additive

Functional nano-encapsulated phase change materials

BULK RESINS

- **Incorporation & Dispersion**
- **Performance evaluation**
- **Characterisation**
- **Small batch manufacture**

Modified bulk resins

BULK RESINS & FIBRES

H&S Risks associated to nanomaterials

Prepreg Materials

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Functionalised Silica nanoparticles for hydrophobicity

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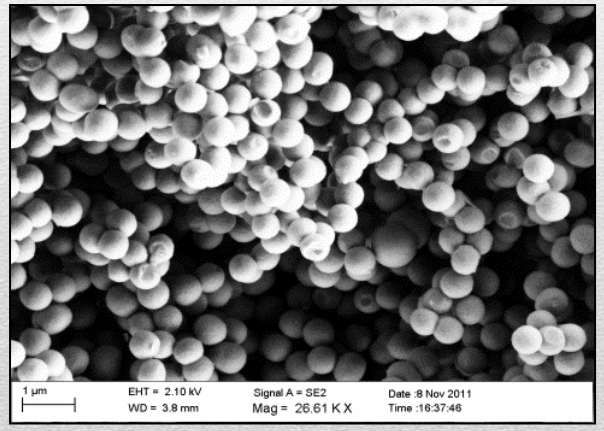
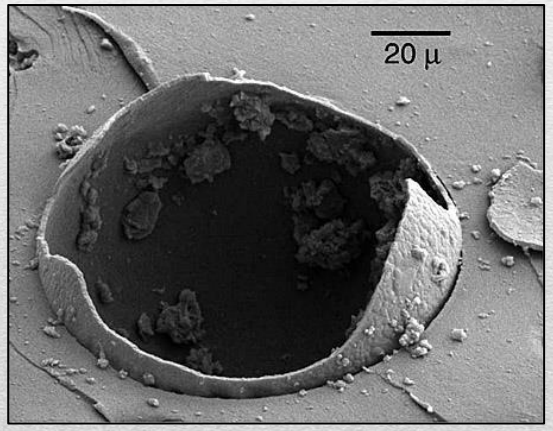
Self-healing additives

Additives development

1) Functional silica nanoparticles (TWI)
2) Functional encapsulated PCMs (TEK)
3) Self – healing additives (LEI)



Functional encapsulated PCMs



Self-healing additives

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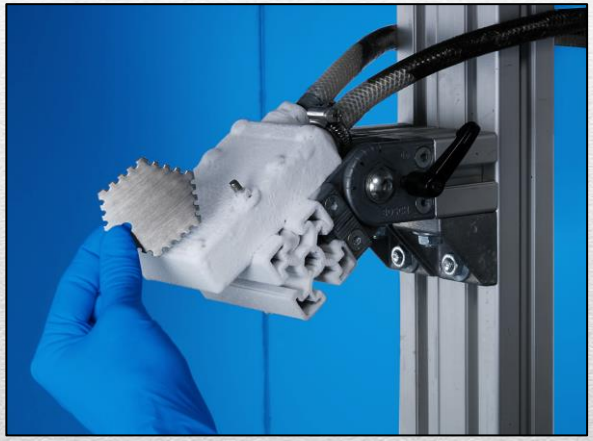
EIROS – Evaluation of ice-phobic behaviour

- Ice test chamber for the initial assessment of surfaces in an early development stage



(1) Rime test: Simulates formation and adhesion of rime

(2) Ice rain test: Simulates water run-off and subsequent formation of clear ice

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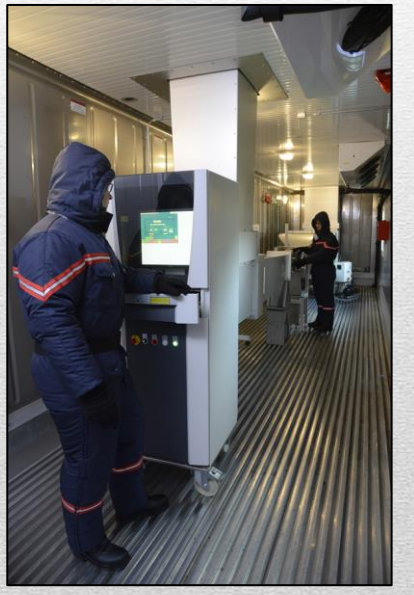
EIROS – Evaluation of ice-phobic behaviour

(1) Ice lab with temperatures down to -30°C, controlled humidity and additional test equipment

(2) Wind tunnel with temp. down to -30°C, wind speed 350km/h, supercooled water droplets

Allows research on icing processes and **ice adhesion**; Simulates conditions for cooling units, HVAC systems



Simulates conditions for e.g. aircraft, wind turbines

(3) Ice-adhesion test set-ups (e.g. centrifuge, cylinder)

Test phase started, results will be available soon

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