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IceBreaker -

Breaking the ice - novel energy efficient hybrid de-icing systems

Project number:
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48338450

Jia Min Chin
University of Vienna
Wien

Consortium Partners

- **University of Vienna** (Assoz. Prof. Jia Min Chin)
- **Erich Schmid Institute** (Priv. Doz. Dr. Megan J. Cordill)
- **Austrian Institute of Icing Sciences, AIIS** (Thomas Neubauer, BSc, MSc)
- **Rail Tec Arsenal, RTA** (DI Dr. Ingeborg Bednar)
- **Villinger** (Markus Villinger, Ira Villinger, BSc)

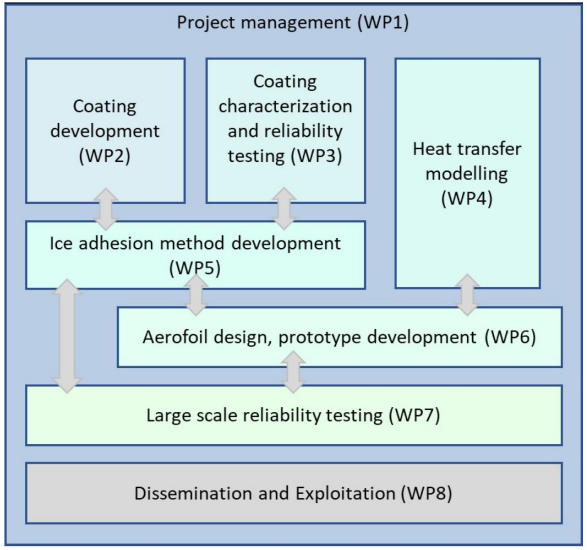
Note: Institute partner representatives are in brackets

Goal of IceBreaker

- to develop hybrid de-icing systems that are reliable, effective, long-lasting, and require less energy for heating by:
  - developing easily applied coatings with covalently bonded lubricants
  - With thorough and rigorous characterization under relevant conditions (temperatures, humidities, and wind speeds) to quantify ice-phobicity and lifetimes
  - verifying electrical energy requirements and improving the heat transfer and energy efficiency of Villinger's electrothermal de-icing systems
  - combining the above into a well-integrated and reliable system

Work Packages and Time Plan

- **WP1. Project Management (11/23 – 10/26)**
- **WP2. Coating Development (11/23 – 10/26)** – Develop novel coatings with improved properties which reduce ice-adhesion
- **WP3. Coating characterization and reliability testing (11/23 – 7/25)** – Defined characterization routine for icephobic coatings with testing of coating reliability over time and cycling.
- **WP4. Heat transfer modelling (11/23 – 6/25)** – To develop working simulation protocol to simulate heat flow and design most effective heating structures for targeted heating.
- **WP5. Ice adhesion method development (11/23 – 10/26)** – Lab-based ice adhesion quantification, adapting to small scale rotor rig testing. Develop machine-learning to accelerate prototyping and R&D.
- **WP6. Aerofoil design and prototype development (11/23 – 6/25)** – Coated and non-coated aerofoils with incorporated thermal de-icing system will be manufactured for comparison testing.
- **WP7. Large scale reliability testing (5/25 – 10/26)** – Aerofoil prototypes will be tested in wind tunnel experiments, to evaluate coating ice-phobicity and performance. Novel in-situ ice adhesion testing will be trialed.
- **WP8. Dissemination and Exploitation (11/23 – 10/26** – through workshops, conference participation, presentations to the public, journal publications, and generation of utility model.



Dissemination and Exploitation

- Coatings are intended for use to minimize ice-adhesion (passive anti-icing) for aerospace (leading edge of wings/rotors) applications
- To be combined with the active heating of Villinger's electrothermal ice-protection systems – heat/thermal distribution modeling inside aerofoil
- Study ice-phobic coatings at the relevant temperatures and humidities using in-situ imaging at the nano and micro-scales – determine mechanisms that lead to improved ice-phobicity
- Experimental methods for icing wind tunnel testing:
  - Develop new (in-situ) testing methods for ice adhesion that can be utilized inside icing wind tunnels or climate chambers –
  - Small scale rotor test rig adaptation for ice adhesion testing
  - Ice density measurements (for adhesion modelling)
  - Extension of time resolved ice accretion documentation method (4D scanning)
- Improved testing facilities and methods for icing wind tunnels and climate chambers - as current lab tests often show good performances of anti-icing coatings which can not be reproduced in icing wind tunnel testing

Contact Information

- Coordinator(s):
- Assoz. Prof. Jia Min Chin: jiamin.chin@univie.ac.at
- Priv. Doz. Dr. Megan J. Cordill: megan.cordill@oeaw.ac.at