

Hygrothermal performance of energy activated external thermal insulation composite system

Summary

The main goal of this project is to develop hygrothermal performance of the Energy Activated External Thermal Insulation Composite System for building envelope, by combination of traditional low thermal conductivity insulation system with high heat capacity phase change material and flexible photovoltaic system generating electrical power.

Research field:	Building and Civil Engineering and Architecture
Supervisors:	Prof. Dr. Targo Kalamees Dr. Simo Ilomets
Availability:	This position is available.
Offered by:	School of Engineering Department of Civil Engineering and Architecture
Application deadline:	Applications are accepted between September 01, 2021 00:00 and September 30, 2021 23:59 (Europe/Zurich)

Description

It is widely recognized that building sector accounts for almost 40 percent of global energy consumption, simultaneously playing the key role in obtaining the energy performance improvement targets. EPBD is strongly focused on the improvement of thermal insulation of the building components leading to the decrease of heating energy demand as well as production of the renewable energy on-site. However, such an approach leads to the necessity to improve thermal energy performance of the building envelope and activate the opaque building surfaces to produce electricity.

The main objective of the project is to develop hygrothermal performance of advanced functional material composite with new physical properties, leading to advances in the area of smart thermal insulations and building integrated photovoltaic. The En-ActivETICS solution is a new step in development of building facade technology allowing to achieve a component classified to the group of functional material. The innovative character arises due to the research and technological challenge which is the development of novel, cost and energy effective building component, examination of its thermal and mechanical properties as well as validation and demonstration of the proposed solution in relevant environment. The final result of the PhD project will be from hygrothermal point of view tested En-ActivETICS, revealing the capability to adjust its physical properties for better building performance.

Research tasks:

- determination of the integration technique of FPV with external layer of ETICS, considering FPV cells connection and electrical energy utilization
- examination of hygrothermal properties
- validation in relevant environment – climatic chamber test
- performance investigation in relevant environment – building scale experiment
- development of a calibrated computational model to support application decision-making
- analysis of the system performance under different climatic conditions

Applicants should fulfil the following requirements:

- Highly motivated, ability to work both independently and in a team;
- Research experience in building physics (hygrothermal modelling, laboratory and field tests);
- Publishing experience (scientific journals, conference presentations);
- MSc in Civil Engineering
- Experience in working on a construction site

- Excellent organizational skills



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