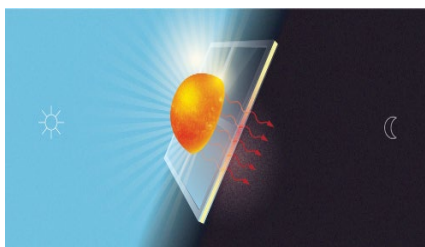




Kandidatarbete
Examenskod ACEX10



Performance of smart window glazing

Part 1: experiments

Windows are essential parts of building envelopes because they provide daylight and fresh air to the indoor environment, as well as a visual and sound connection with the surrounding. At the same time, due to their functional requirements, windows are the least energy efficient parts in buildings. There are various techniques to reduce heat losses through windows such as multiple glazing, insulated, airtight window frames, and low emissive coatings. Thermochromic coatings, PCMs (phase change materials), and photoswitches molecules are examples of novel systems for changing the solar radiation properties of window glazing in response to the ambient temperature and/or solar exposure. Since these systems operate without a human-aided control, they are called smart solutions.

This project aims at studying the thermal and visual performance of smart windows (thermochromic coatings, PCM layers, and molecular photo-switches). It is composed of two parts. While Part 1 is about experimentation, Part 2 is focused on numerical modeling and simulation. The two parts can be executed separately.

Specific goals of Part 1 are

Review of measurement techniques and standards for glazing systems

- the state of the art of smart windows and the main physical differences and impacts on the indoor environment
- techniques, standards, and instruments for measurements of thermal, solar, and visual transmittance (VT) of window glazing systems.

Target group of students

TKSAM Civil engineering

Group size

4-6

Special requirements

Students interested in learning or improving experimental skills

Suggestion from

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Can the project be duplicated?

No

Design and build of an experimental setup for smart windows

- analysis and modeling of heat transfer in the system (window + experimental setup);
- Build of the CAD model for the chosen experimental setup;
- Plan and execute the construction of the experimental setup.

Methods

Literature review; light construction work; temperature measurements

Literature recommendation

- [1] Grynning S, Goia F, Time B. Dynamic thermal performance of a PCM window system: Characterization using large scale measurements. *Energy Procedia* 2015;78:85–90. doi:10.1016/j.egypro.2015.11.119.
- [2] Cornaro C, Bucci F, Pierro M, Bonadonna ME, Siniscalco G. A new method for the thermal characterization of transparent and semi-transparent materials using outdoor measurements and dynamic simulation. *Energy Build* 2015;104:57–64. doi:10.1016/j.enbuild.2015.06.081.