



Aalborg Universitet

AALBORG UNIVERSITY  
DENMARK

## Study of thermochromic glass performance in the Danish climate and visual comfort perspectives

Imbert, Pierre; Larsen, Olena Kalyanova; Johra, Hicham

*Creative Commons License*  
Unspecified

*Publication date:*  
2019

*Document Version*  
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

*Citation for published version (APA):*  
Imbert, P., Larsen, O. K., & Johra, H. (2019). *Study of thermochromic glass performance in the Danish climate and visual comfort perspectives*. Poster presented at CISBAT 2019 – International Scientific Conference, Lausanne, Switzerland.

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal -

### Take down policy

If you believe that this document breaches copyright please contact us at [vbn@aub.aau.dk](mailto:vbn@aub.aau.dk) providing details, and we will remove access to the work immediately and investigate your claim.



# Study of thermochromic glass performance in the Danish climate and visual comfort perspectives

Paper ID:  
 1358

**Pierre Imbert**, Department of Civil Engineering – National Institute of Applied Sciences (INSA) of Strasbourg – France

**Olena Kalyanova Larsen**, Department of Civil Engineering - Aalborg University - Denmark

**Hicham Johra**, Department of Civil Engineering - Aalborg University - Denmark

## Introduction

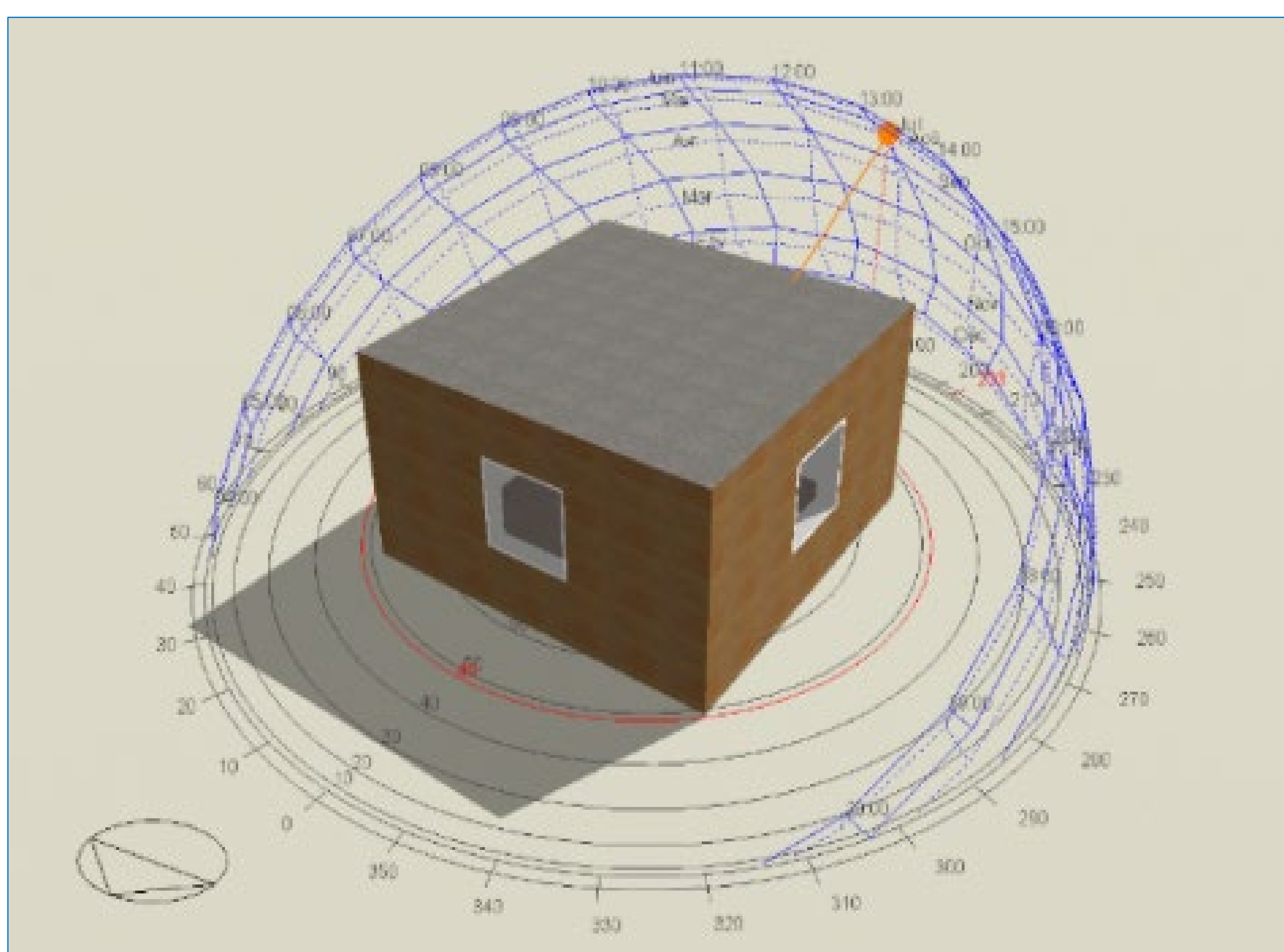
Windows are key elements in the building envelope in terms of energy performance and comfort. Thermochromic materials change their tint, visible-light transmittance and infrared transmittance as a function of temperature. They can be used to form dynamic façade elements for self-regulation of solar gains in order to avoid over-heating inside buildings.

The recent development of these so-called smart thermochromic glazings with the purpose of improving thermal comfort inside buildings raises the question of the visual comfort level offered by such glazings.



## Objectives

This numerical study investigates the indoor illuminance comfort level of thermochromic glazing systems under Danish climate conditions.



## Methodology

The indoor illuminance comfort level inside a Nordic building is simulated for 5 different commercial thermochromic glazing systems:

- Thermochromic Suntuive® from Pleotint company
- 3 thermochromic glazing systems from Lawrence Berkeley National Laboratory
- Thermochromic Ravenbrick® from RavenWindow company

The numerical study was performed with DesignBuilder (EnergyPlus) Software on a one-room building model.

Glazing system	$T_{int}$ transition state	$T_{vis}$ in clear state
Thermochromic Suntuive®	5 °C to 95 °C	$T_{vis} > 0.6$
Lawrence Berkeley National Laboratory 1	25 °C to 75 °C	$T_{vis} > 0.6$
Lawrence Berkeley National Laboratory 2	25 °C to 75 °C	$T_{vis} \sim 0.55$
Lawrence Berkeley National Laboratory 3	25 °C to 75 °C	$T_{vis} < 0.36$
Thermochromic Ravenbrick®	34 °C to 35 °C	$T_{vis} < 0.36$

## Results and conclusions

The thermochromic effect is not activated for a major part of the year because of the cold climate.

Thermochromic systems improve the visual comfort level and reduce glare discomfort by reducing over-lit annual time but increase the demand for artificial lighting.

Wind exposure driving convective heat transfer at the surface of the glazing systems, and sky conditions (cloud cover) have a major impact on the thermochromic glazing's response.

