This thesis is a scouting on the possibilities of combining PCMs and GFRPs into one transparent element, which could upgrade the aesthetical values of standard commercial non-transparent PCM-GFRP systems.

The contribution of this research is twofold, providing:
1) An analysis framework for further exploration on the combination of a PCM and a GFRP, in respect to their basic properties and focusing on their optical properties. The framework occurs from the qualitative and quantitative findings collected via literature study, calculations and experimentation.
2) A guideline and recommendations for synthesizing the above findings into design parameters for potential architectural applications.

Research Question

How can the combination of a GFRP and a PCM be developed into a panel that exploits both their translucency, and what are its potentials as a product in architecture?

Analysis of Basic Properties

Focus on Optical Qualities and Dynamism Potential

1. Materials Tested

A.1. Thermoset Polymers

B.1. Pure PCM

C.1. Polymer+Encapsulated PCM

2. Fabrication of Prototypes

Solid left and spotlight images of a semi-PCD-GFRP panel using hydrated salts as PCM.

Fabrication of GFRP sheets, using the hand lay-up method.

A semi-cast clear Epoxy sheet.

3. Experiments

B. Independent elements

1. Related to the Facade
2. Not Related to the Facade

Recommended Applications

General Recommendations

1. Application Typologies

A. Part of the Envelope
B. Independent elements

2. Application Example

For passive cooling ceiling, assisted with night ventilation, at a room ΔT=4°C, and a α_air=15. (Example)

For an active cooling ceiling, at a liquid cooling ΔT=6°C, and a α_air=15. (Example)

For an automatic cooling ceiling, with night cooling, at a room ΔT=4°C, with α_air=15. (Example)

For an external cooling ceiling, across the building, with night cooling ΔT=4°C, and α_air=15. (Example)