

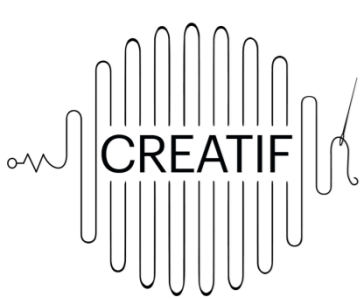
Dispenser printed actively controlled thermochromic colour changing device on fabric for smart fabric applications

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Overview

- EU CREATIF project
- Chromism
- Materials
- Dispenser printing
- Results
- Conclusions



CREATIF project

- This research is funded within an EU project: CREATIF (www.creatif.ecs.soton.ac.uk) of which the target is to offer the creative and cultural industries state of the art printed smart fabrics and collaborative design software.
- Smart fabric creative applications are: proximity sensing, electroluminescence, **colour change** and sound emission.
- Demonstrating the fundamentals of a dispenser printing process to achieve thermochromic devices on fabric substrates.

Thermo-chromism

Photo-
chromism

Thermo-
chromism

Chromism

Mechano-
chromism

Other
Chromisms

Electro-
chromism

Thermochromic materials

Direct stimulus



Liquid crystals

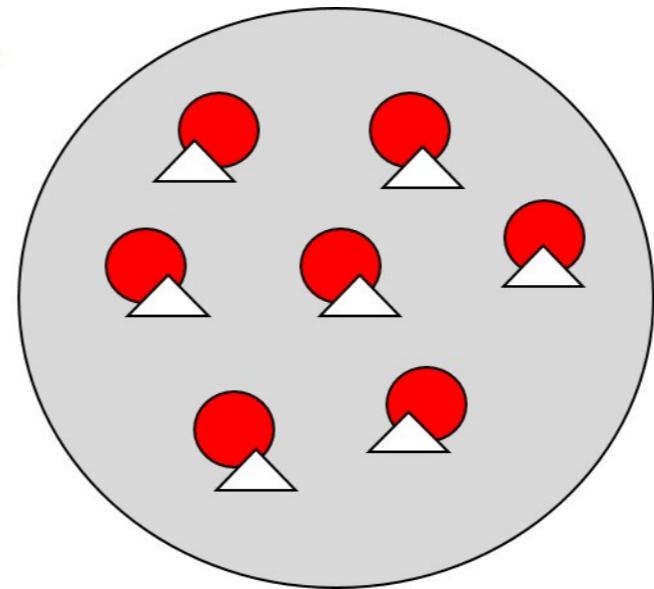
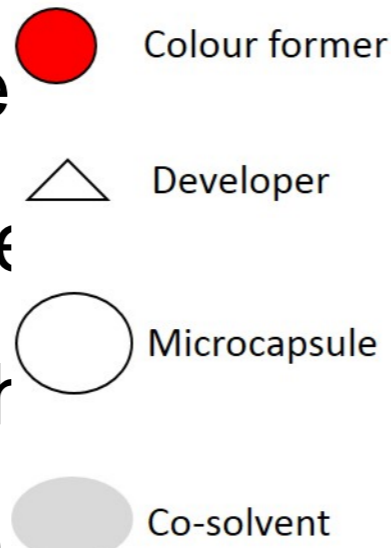
Indirect stimulus



Leuco dyes

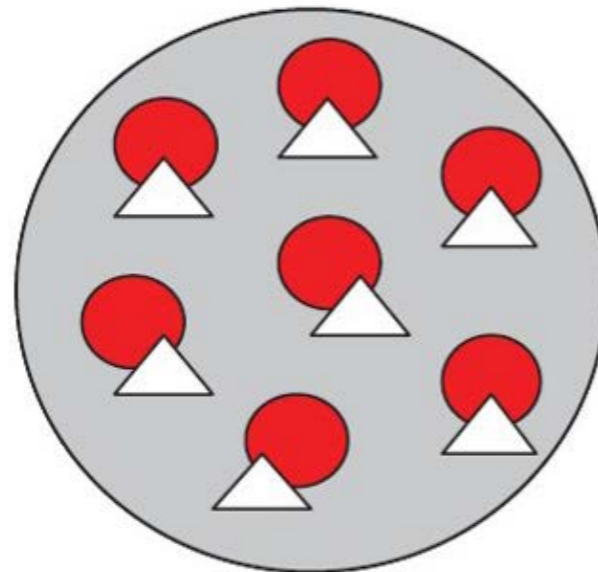
Leuco Dyes

- A wide range
- A wide choice
- The colour change of a particular



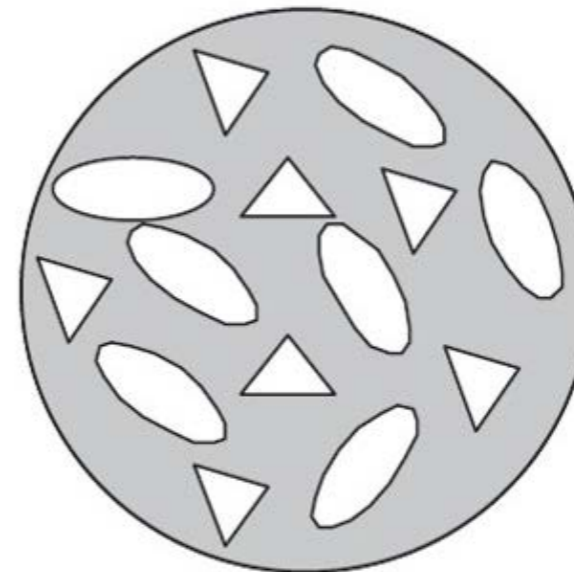
temperature instead

- Can be applied



coloured solid

above m.pt.
 ⇌
 below m.pt.

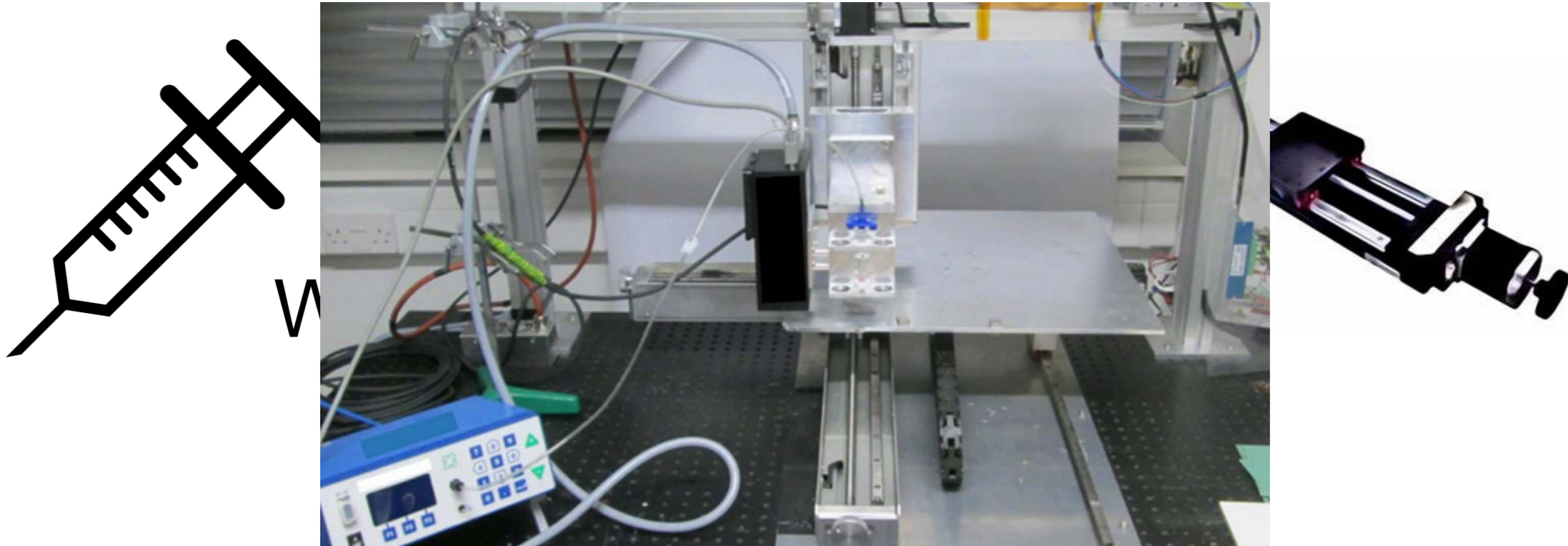


colourless liquid

textile



Dispenser printing



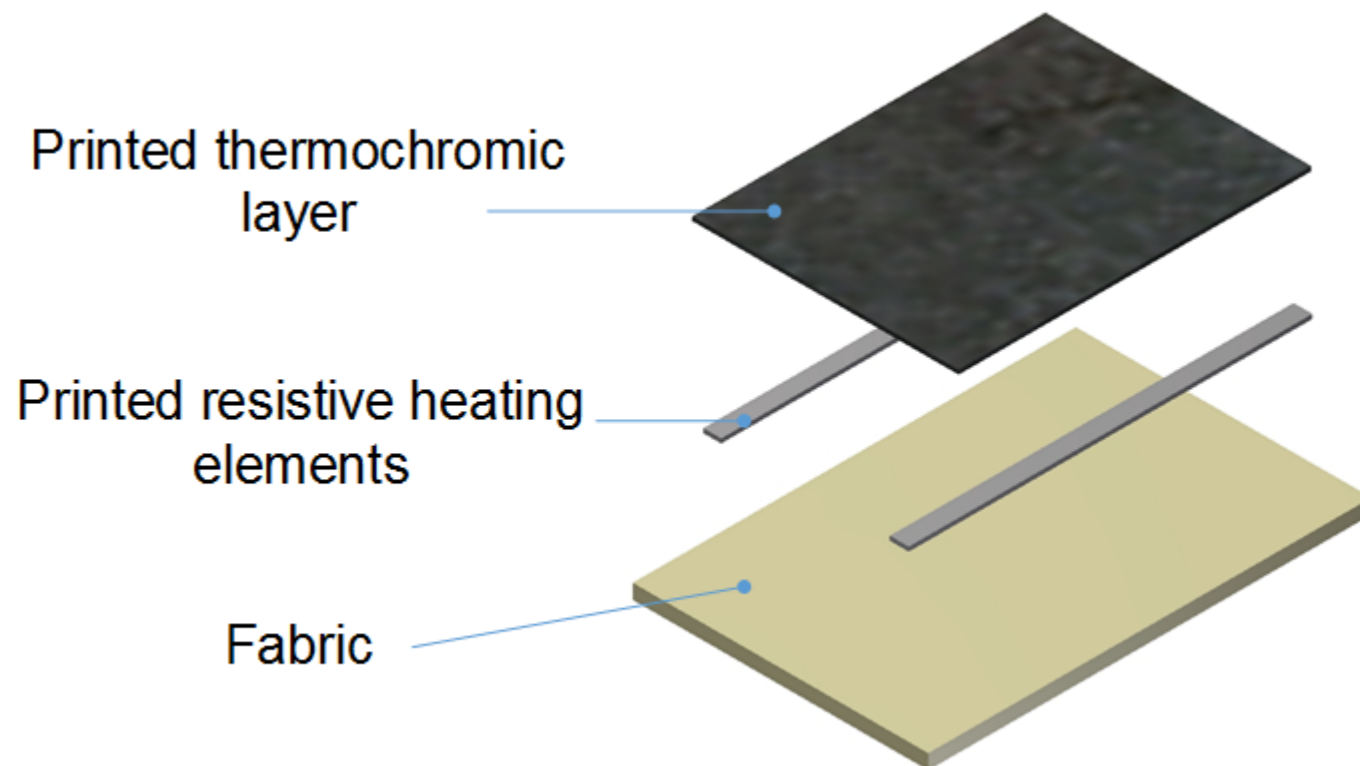
A dispenser printer is neither a 3D printer nor an inkjet printer

Viscosity, Material types, Capability

Active control thermochromic materials

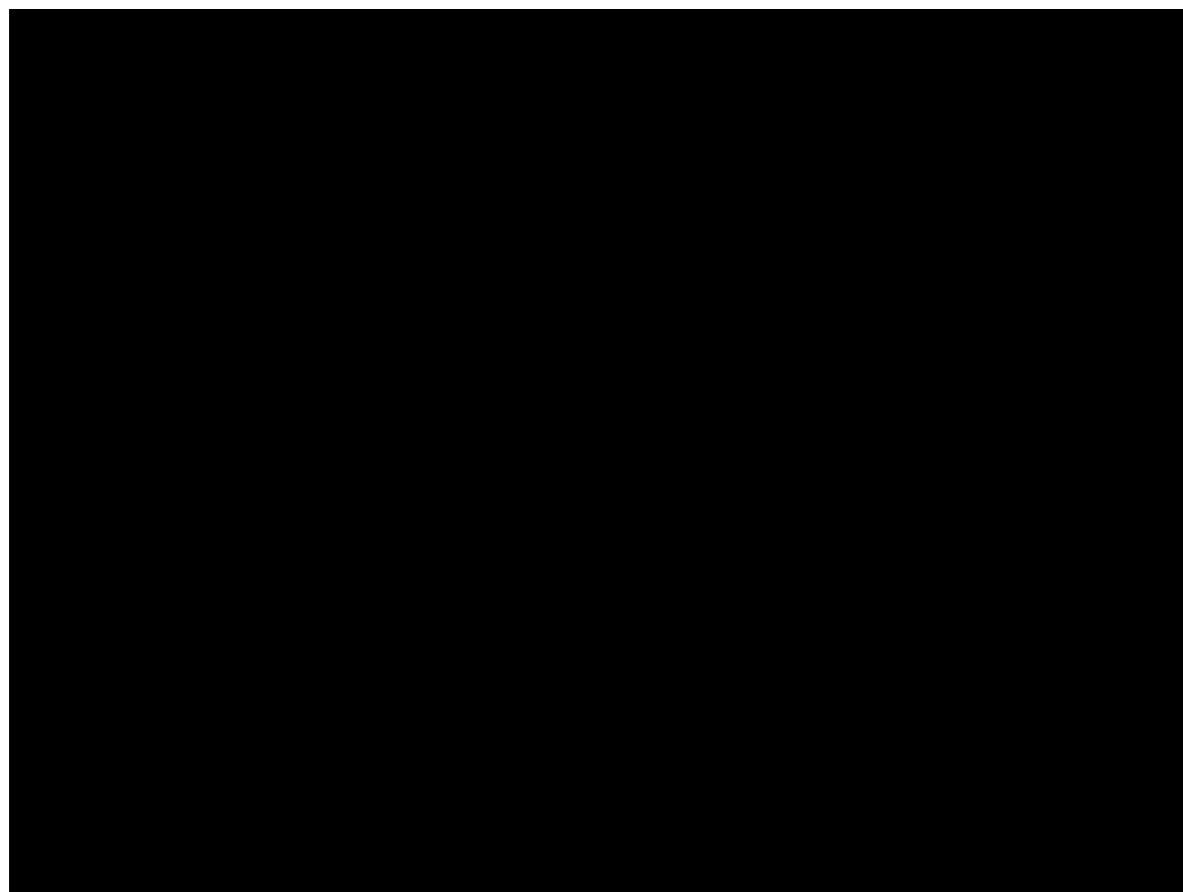
- The colour changing of a thermochromic material can be triggered passively or actively (electronically).
- A printed resistive heater controls the colour changing process of the thermochromic device.
- The temperature generated from the heater must match the activation temperature of the thermochromic material.
- The thermochromic device can interact with other external sensors.

Thermochromic device structure



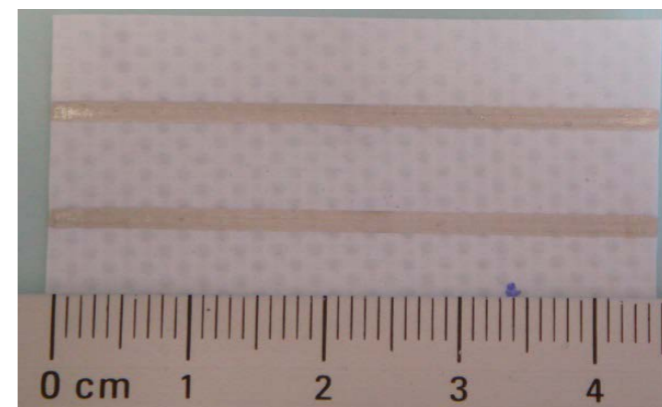
- Fabric: PVC coated polyester fabric
- Thermochromic ink: activation starts from 31 °C
- Conductive ink: cured at 125 °C
- Drive current: 0.6A

Dispenser printing and results



Dispenser printing process

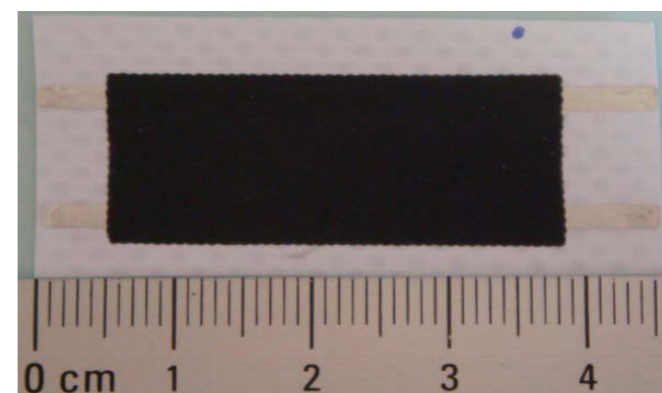
Resistive heater



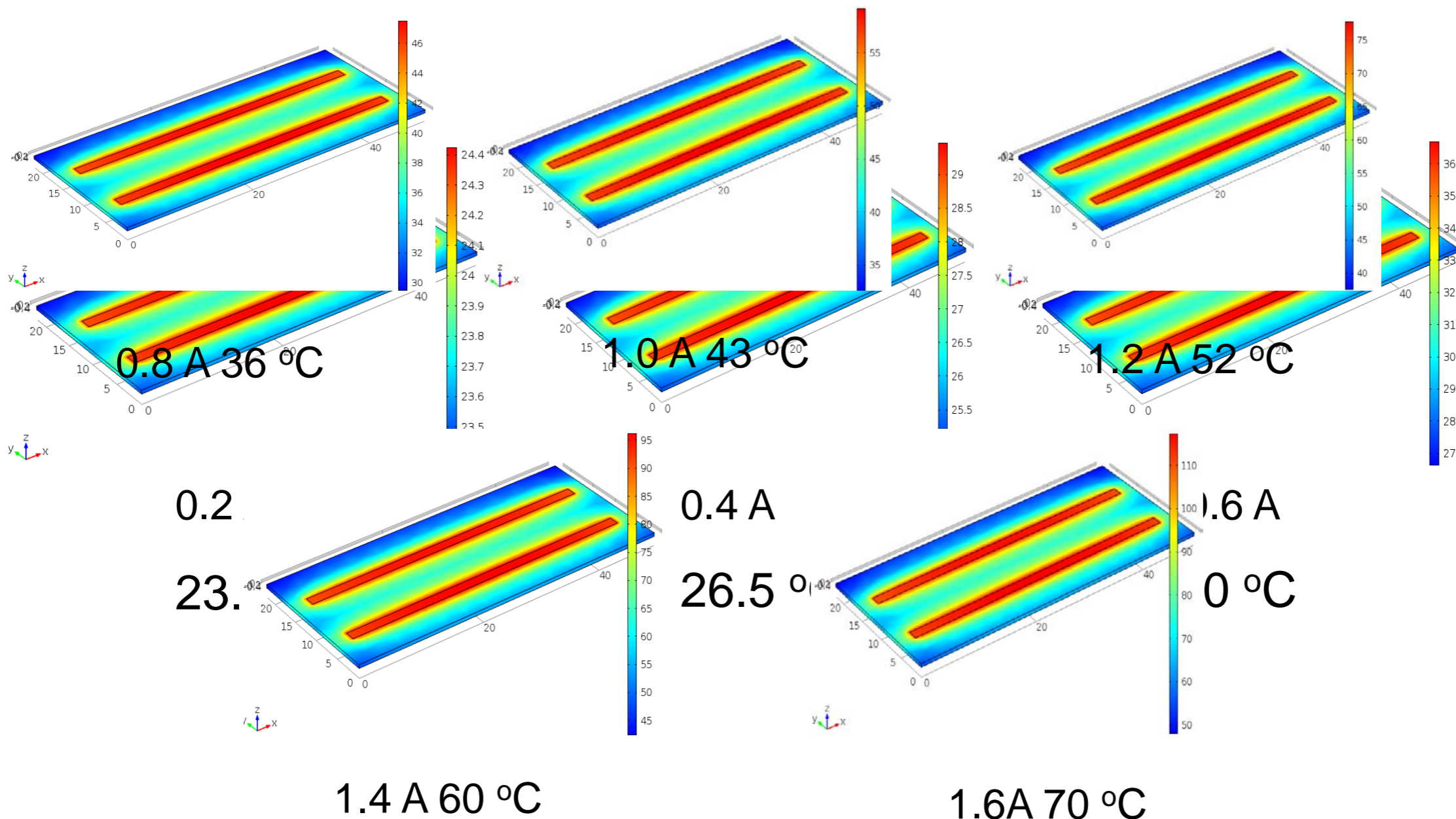
Item to be displayed



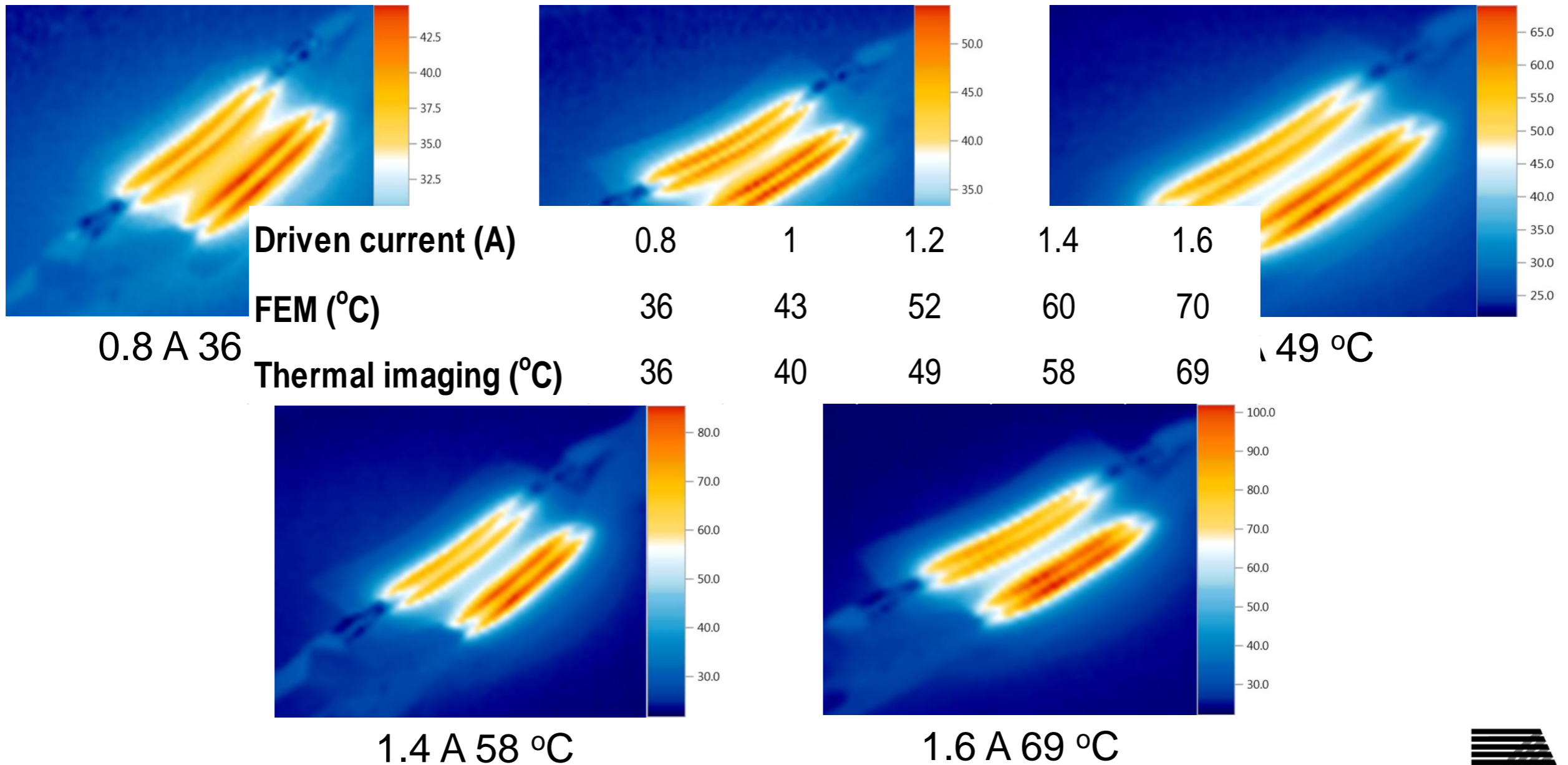
Thermochromic layer



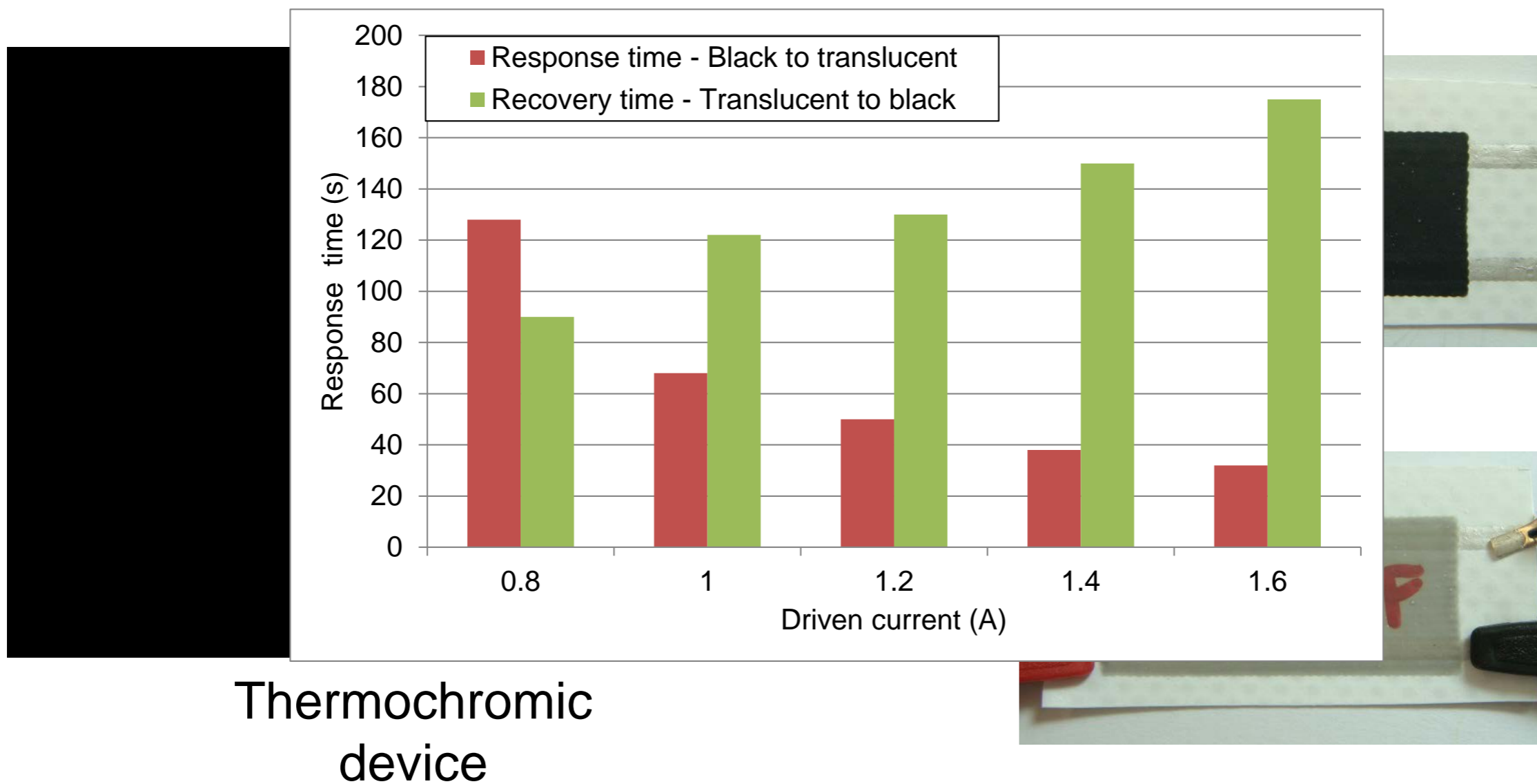
Heater design FEM evaluations



Heater design Thermal imaging evaluations

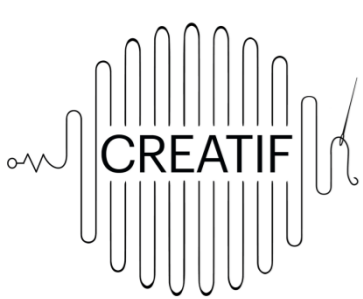


Dispenser printing and results (cont.)



Conclusions

- A printable thermochromic ink has been achieved with an activation temperature around 31 °C.
- The printed thermochromic layer changes its colour from opaque black to translucent to review anything underneath.
- The cured thermochromic and conductive layers are flexible.



Thank you.