

Review of Peltier and Resistive Heating Elements through Infrared Imaging



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Abstract

The study includes the review of the heating elements to develop the fundamental understanding. The heating elements to be investigated are Peltier and Resistive types. Both have different working principles and they are used in various industrial applications for cooling and heating purposes. The Infrared (IR) wavelength is emitted by each object at a temperature above absolute zero. IR light is electromagnetic radiation that has a longer wavelength as compared to the visible light. It has a spectral range starting from the edge of the visible red light from 0.74μm to 300μm. The infrared spectral band has four sub-bands; near infrared (0.75–3μm), medium wavelength infrared (3–6μm) MWIR, long wavelength infrared (6–15μm) LWIR and very long wavelength infrared (15–1000μm) VLWIR. The working principle of IR camera is based on the thermographic imaging. A thermal signature is produced based on the emitted infrared radiations. These thermal radiations are captured by the detector elements of an imaging device such as an IR camera. In this work, the heat fluxes will be observed and compared using LWIR imaging. LWIR imaging will shed light on the thermal capability of the heating elements.

Heating Elements



PTC Resistive Heating Device

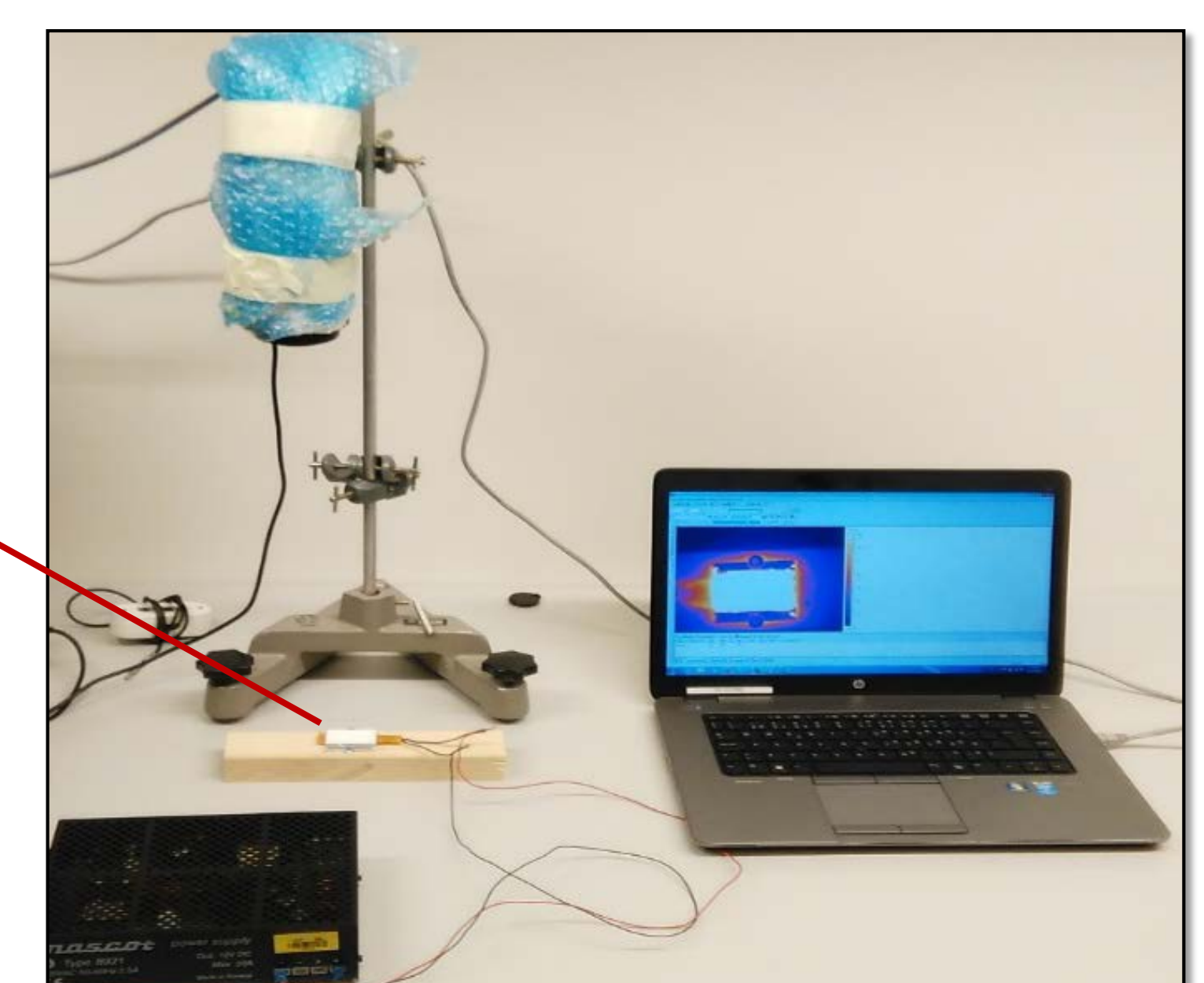


Peltier/Thermoelectric Device

Specifications	Peltier /Device	PTC Resistive Heating
Max Operating Temperature (°C)	138°C	100°C
Input Voltage (V)	12-16.4 VDC	12-24 VDC
Power Output (W)	50 W	50 W
Delta Temperature (Max)	75 °C approx.	-

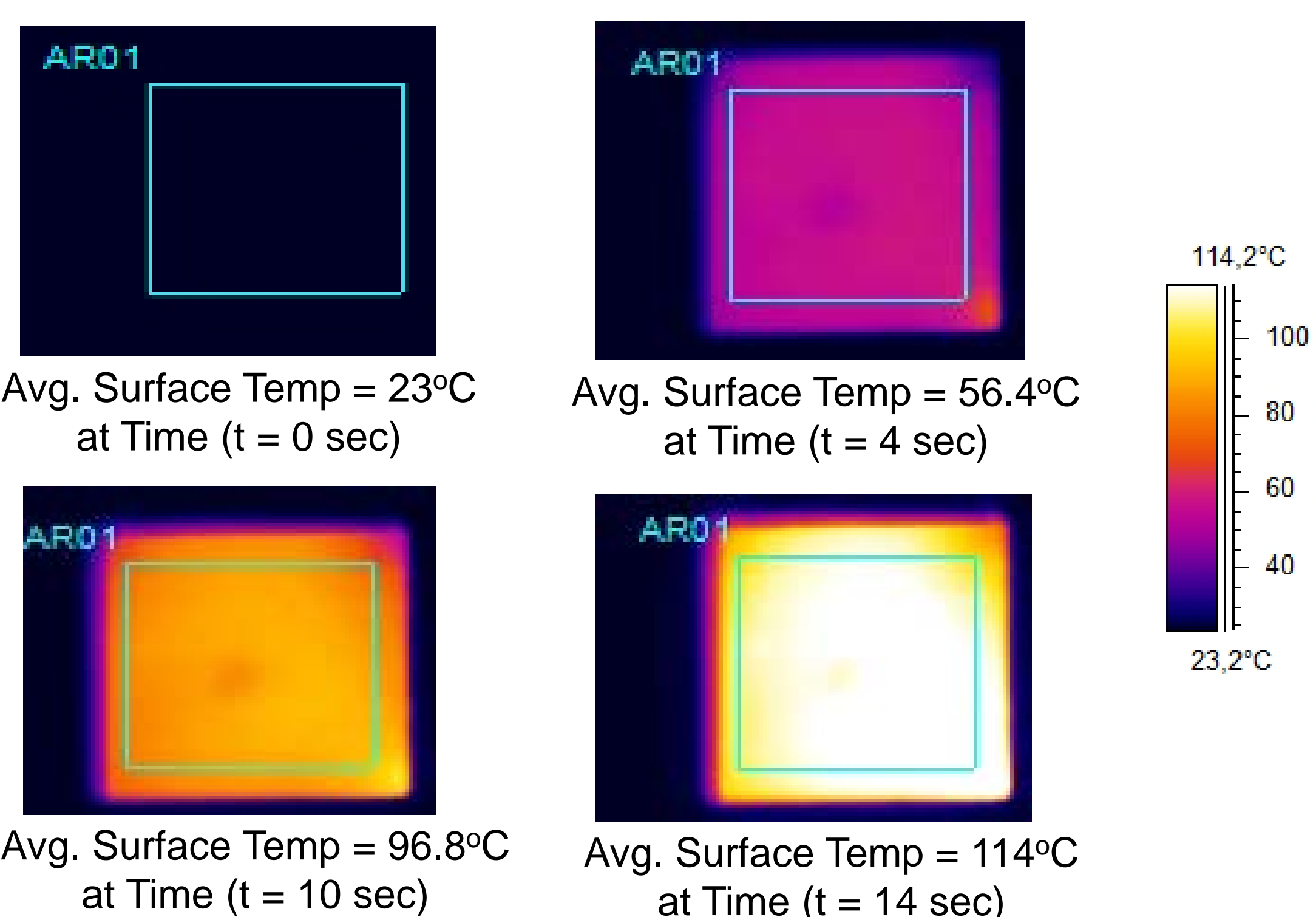
Methodology

- Preparing the Setup of Target Objects (Heating Elements)
- Preparing the IR camera setup including electrical and mechanical connections
- Performing Power On and Startup procedure
- Capturing the Image in customized FLIR® Researcher IR software
- Performing the appropriate Image recording settings
- Validating the recordings
- Performing imagery analysis using research software toolbars

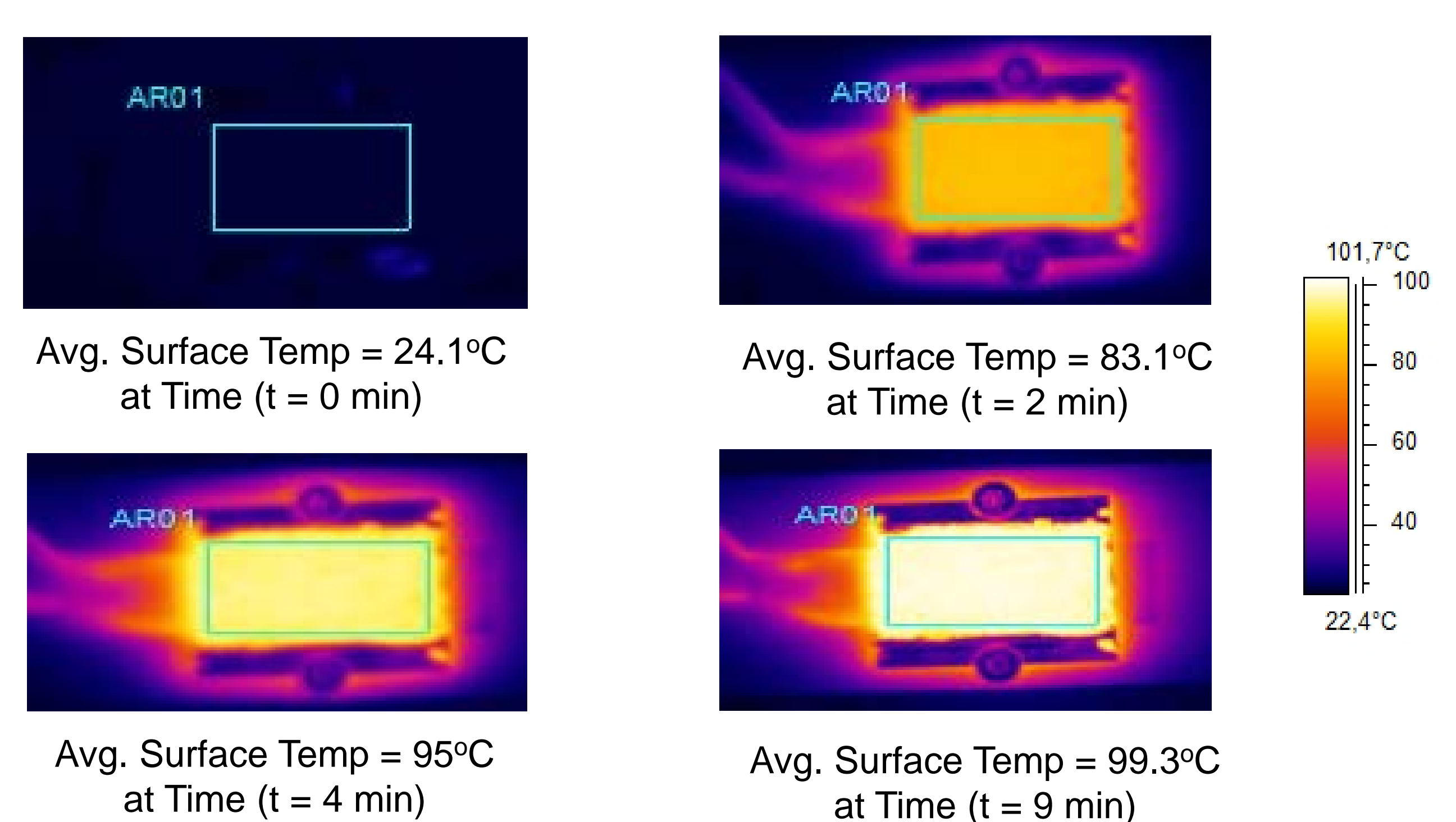


Results

Peltier Device



PTC Resistive Heater



Conclusion

This work included the basic understanding of the two types of heating devices that are commonly used in commercial and industrial applications. The study includes the understanding and the operations of Infra-Red (IR) Camera through its research software. A few preliminary experiments were performed to observe thermal units of the heating devices. The typical operational behavior of both heating devices was clearly observed through the IR thermography.

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