Infrared absorbing material for Indoor Heat Dissipation

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1. Introduction

Daytime radiative cooling (DRC) materials can be used for heat dissipation, and it attracts a lot of attention recently [1]. The radiative cooling materials are often chosen to have high infrared light absorption. A radiative cooler is designed to move the heat from the inner space with infrared absorbing material, which call the *Janus* emitter [2]. The inner surface of the cooler material can absorb the thermal heat while the outside of the cooler mateiral can emit the infrared light to the air. In this work, an infrared absorbing cooler was made by cooling paint and copper. Unlike the *Janus* emitter, the cooler studied in this research is using the heat conduction between the copper and outside air. In order to study the cooling performance of the cooler, the different samples are heated in an experimental set up and the temperature variences are measured.

2. Methodology

The cooling material which was made by glass microsphere has been studied [3]. The glass microspheres mixed with transparent paint and painted on the copper sheet are chosen for the infrared absorbing material in our study. An indoor experiment is set up to control the environment parameters. The schematic drawing and the photo of the experimental setup are shown in Fig. 1. The heater and the temperature sensor are put inside the hollow polystyrene. The metal ceramics heater is used to simulate the heat source, which is like electronic heat. It can warm up the air inside the experiment setup. The power supply can optimize the power of the heater.

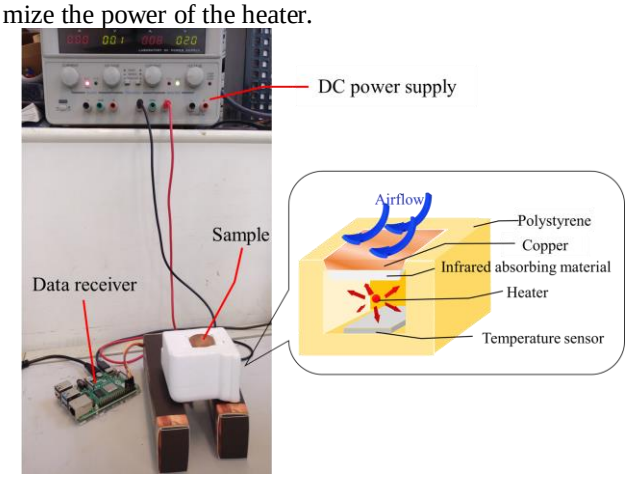

Fig 1. Schematic drawing and photo of experiment setup.

The air temperature of inside the experiment can be detected, and the air flow with the fan can be controlled air outside. The different samples are covered on the experiment setup and heated for 15 minutes. The power of heat is 0.16 W.

3. Results and Discussion

To study the effects of the infrared absorbing cooler, we compared the temperature of polystyrene (PS), copper sheet, and cooling samples. Because the PS is a heat-insulating material, the PS sample does not have good heat dissipation in the experiment setup. On the contrary, copper is a heat conductor. Therefore, the temperature of copper sample is lower than the PS sample. The cooling sample is infrared absorbing material painted on a copper sheet. With the infrared absorbing material, the cooling performance of the cooling sample is better than the bare copper sheet. Furthermore, the temperature difference of the three samples is more evident for the cases with air flow. The experiment results of the measured temperature for the different samples are shown in Fig. 2.

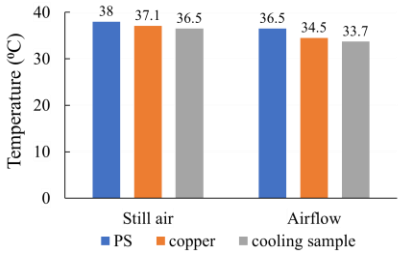

Fig 2. Measured temperatures for difference samples with and without air flow.

4. Conclusion

According to the experiment results, the concept of infrared absorption material to increase the heat dissipation can work. In future work, this concept can be used for the cooling case of computers and mobile phones. According to the performance of our design, which combines DRC and enclosure, it may be able to use as the cooling enclosure to cool down the electronic device heat.

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References

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