

Nanocomposite implementation with Solar box model cooker using flexible thermography

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Abstract:

In this study, three SBCs are created: a phase change material (PCM)-containing SBC (made of used cooking oil and C₄H₄O₃), a novel SBC (NPCM)-containing SBC, and an SBC without NPCM. Fuzzy logic, Cramer's rules, and image processing techniques were used to experimentally create and assess the performance of the unique suggested cooker integrated with NPCM (MgAl₂O₄/Ni/Fe₂O₃-PCM). Additionally, under solar radiation of 1,037 W/m², the temperatures of the bar plate absorber were 163.74 °C, 147 °C, and 113.34 °C, respectively.

Introduction

Palani et al [1] investigate the influence of NPCM enhance the food stuff examined by edge detector segmentation techniques. It shows the 45.14% of the thermal act and 53.10% adaptiveness of nanoparticle. Palanikumar et al [2] combined the fuzzy techniques hybrid with thermal image processing technique to analyze the food stuff. The solar model cooker obtain the overall efficiency 15.41% by the implementation of C₁₈H₃₆O₂ and Al₂O₃. Palanikumar et al [3] experimentally investigated the composition of photothermal materials of Tantalum pentoxide doped through stannic oxide – Silver salts. Nanostructure coated solar cooker improve the bar plate temperature until 398°F.

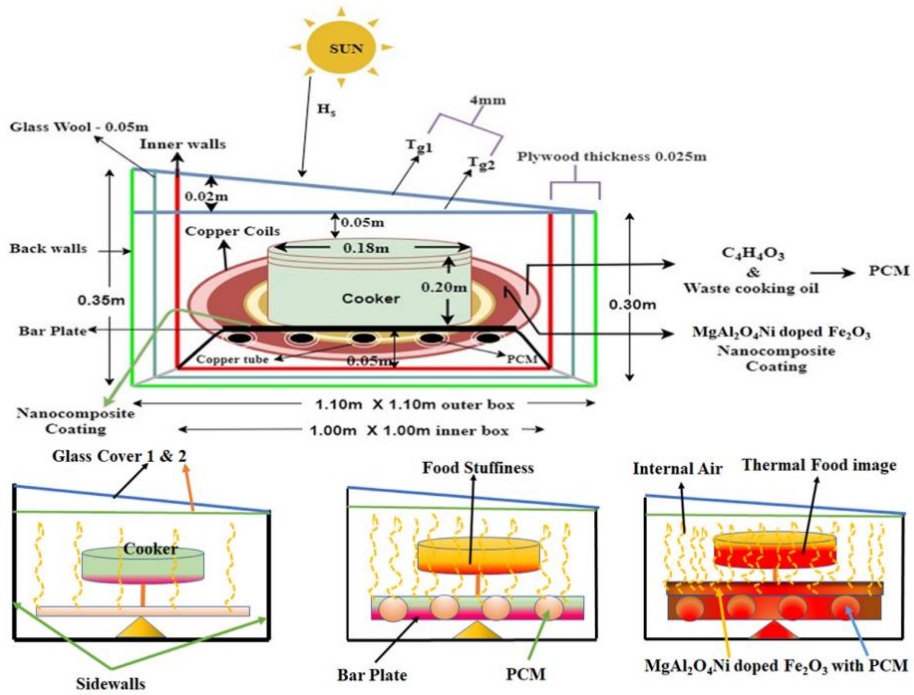


Fig 1. Schematic diagram



Fig 2 Experimental process

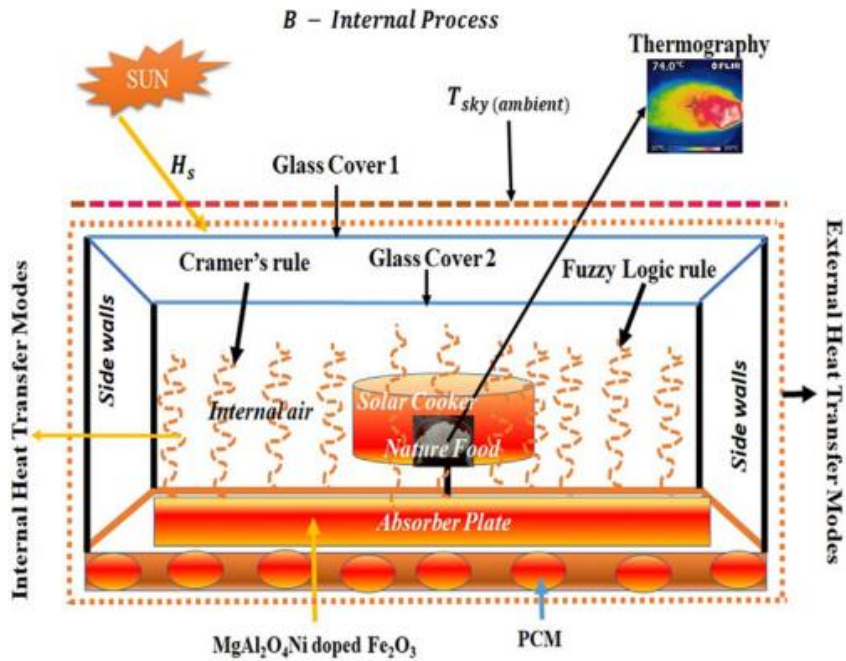


Fig 3 Internal process

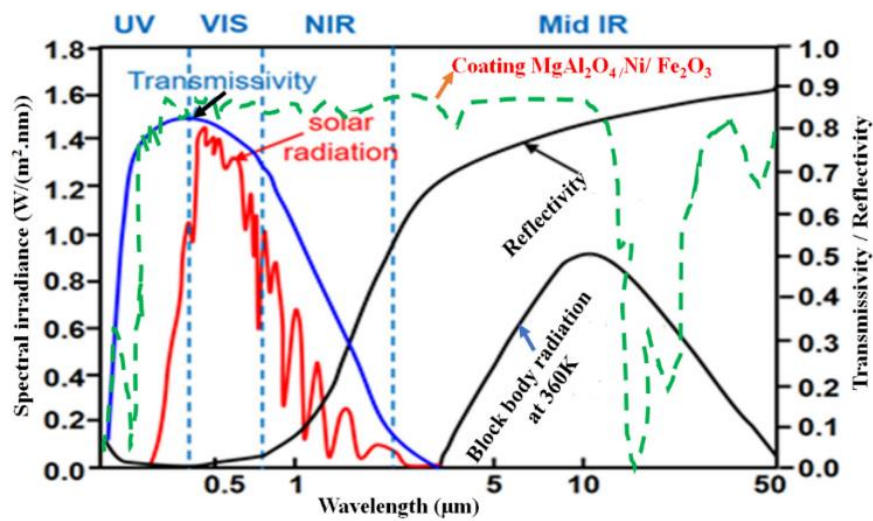


Fig. 4 Solar spectrum reflectance/absorbance

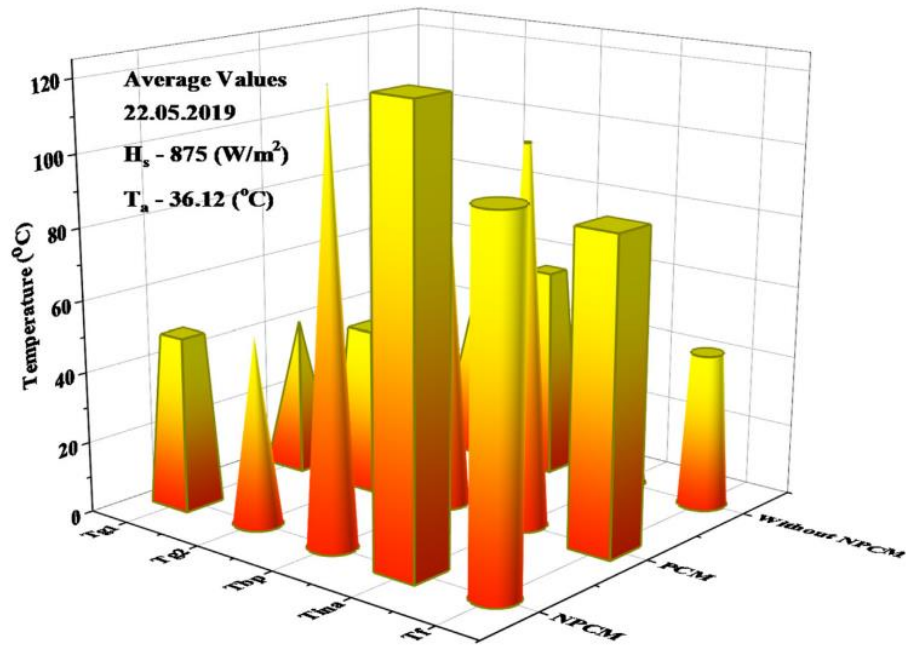


Fig. 5. Average values of different parameter

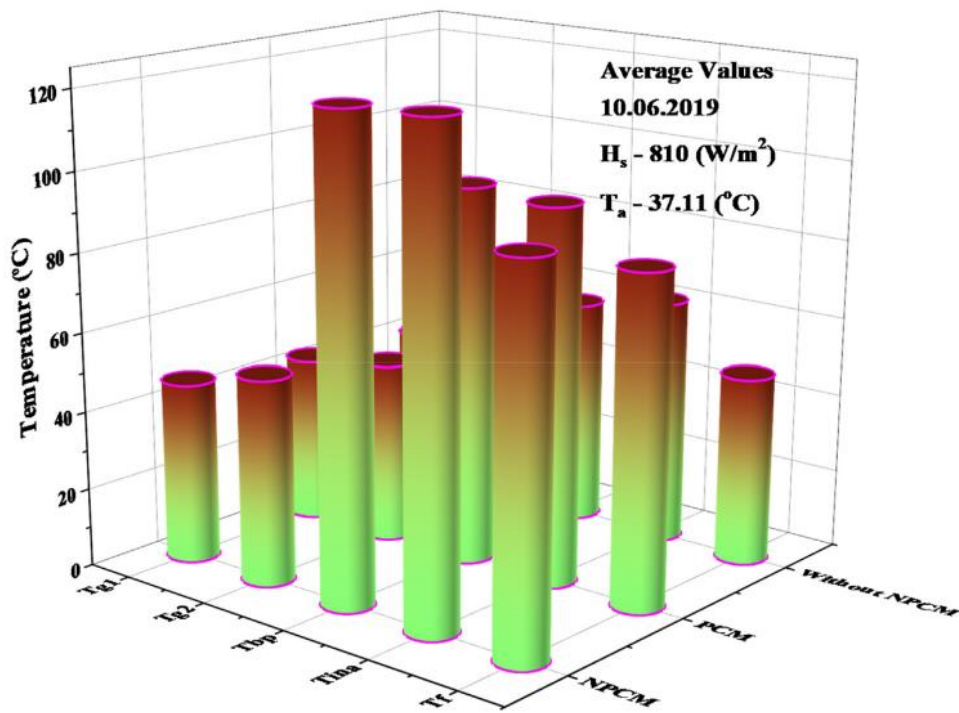


Fig.6. Average values different parameter

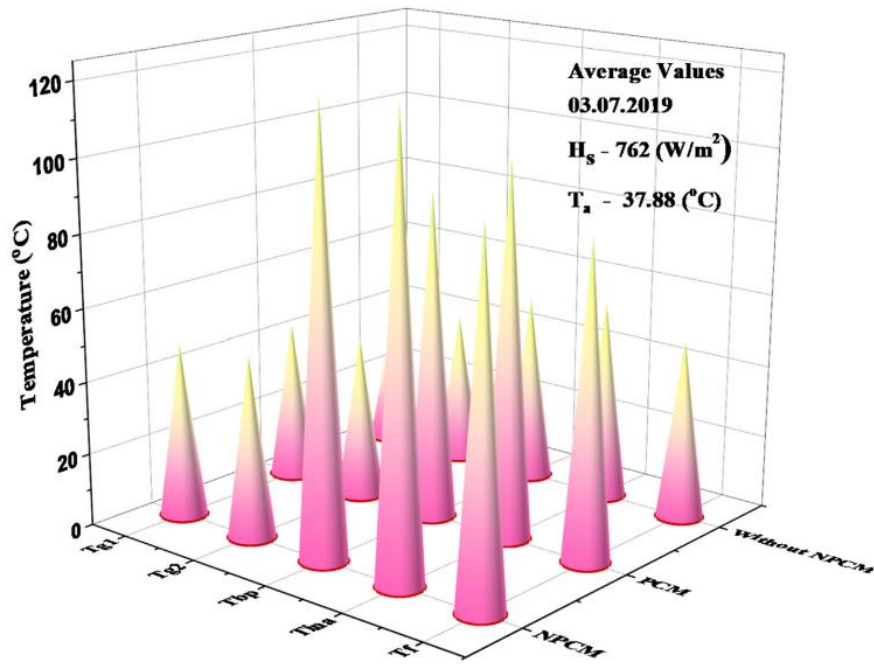


Fig. 7. Average values of different parameter

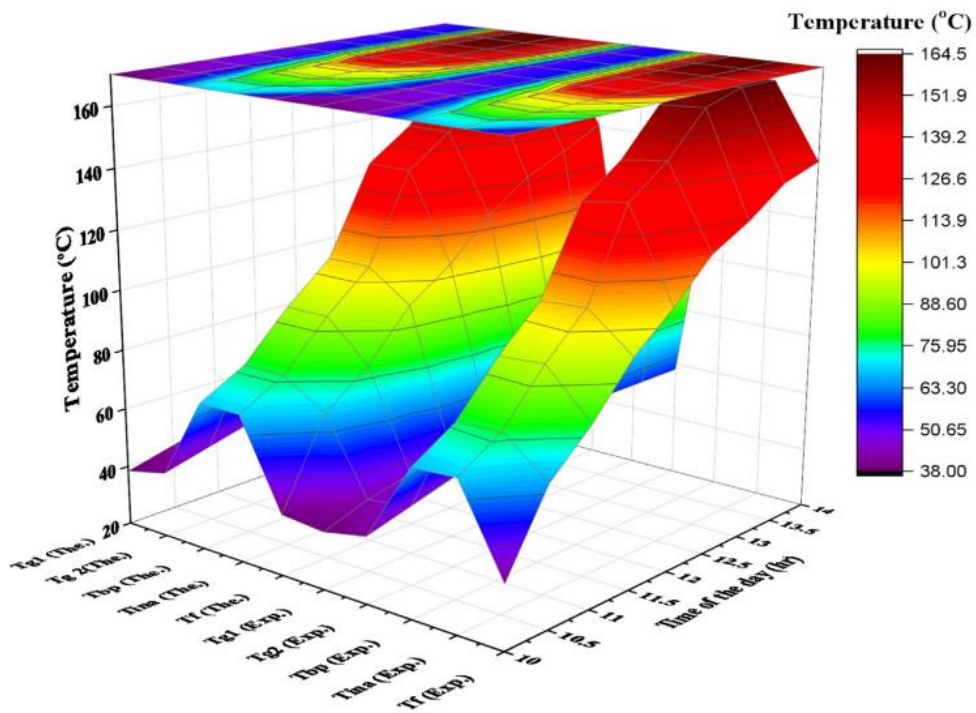


Fig. 8. Experimental and theoretical temperature values

Reference

- [1] G Palanikumar, S Shanmugan, B Janarthanan, R Sangavi, P Geethanjali. Energy and Environment control to Box type Solar Cooker and Nanoparticles mixed bar plate coating with Effect of Thermal Image cooking pot. Material Today proceedings Volume 18, Part 3, 2019, Pages 1243-1255 <https://doi.org/10.1016/j.matpr.2019.06.586>
- [2] G Palanikumar, S Shanmugan, Chithambaram Vengatesan, Periyasami Selvaraju. Evaluation of fuzzy inference in box type solar cooking food image of thermal effect. Environmental and Sustainability Indicators Volumes 1–2, September 2019, 100002 <https://doi.org/10.1016/j.indic.2019.100002>
- [3] G Palanikumar, S Shanmugan, V Chithambaram, P Selvaraju. Synthesis, characterization of Ta₂O₅ nanoparticles with doping SnO₂– Ag on solar absorber material and designs analysis of energy production for solar cooker. Materials today proceedings Volume 30, Part 1, 2020, Pages 190-196 <https://doi.org/10.1016/j.matpr.2020.05.740>