ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

Solar cooker fuzzy rules implementation to analyze thermal applications

Ch. Pravalika

Research Centre for Solar Energy, Department of Physics, Koneru Lakshmaiah Education Foundation, Green Fields, Guntur District, Vaddeswaram, Andhra Pradesh 522502, India

Abstract

A design, construction, & performance evaluation of the cooker with a copper absorber panel painted mat black and filled with 1 g of NiO_2 nanoparticles has been constructed. The temperature components have been solved using a Laplacian technique, and the results are compare with trial observations by calculating the RMSE and R_2 values. The values of RMSE and R_2 for the temperature of the glass cover were determined to be 0.115 and 0.993, 0.118 and 0.997, 0.110 and 0.996 for the lid of the cooking vessel, 0.119 and 0.996 for the base of the cooking vessel, and 0.114 and 0.998 for the cooking fluid, respectively.

Introduction

Palanikumar et al [1] experimentally investigated the composition of photothermal materials of Tantalum pentoxide doped with stannic oxide – Silver salts. Nanostructure coated solar cooker improve the bar plate temperature until 398°F. Palanikuamr et al.[2] compared the performance of different type solar box cookers (waste cooking oil and $C_4H_4O_3$, $MgAl_2O_4$/Ni/Fe_2O_3-PCM, without NPCM). The thermal image processing and mathematical method explains, the bar plate attained the high temperature of 164.12 °C by using the effect of nanocomposite PCM. Palanikumar et al. [3] have been studied the solar cooker perfomance using fuzzy and fourier theorems with differnt types (low, middle, High). The food stuffiness is examined by the themal image process,[4] it explains the cooker achieves productivity up to 7.6%.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

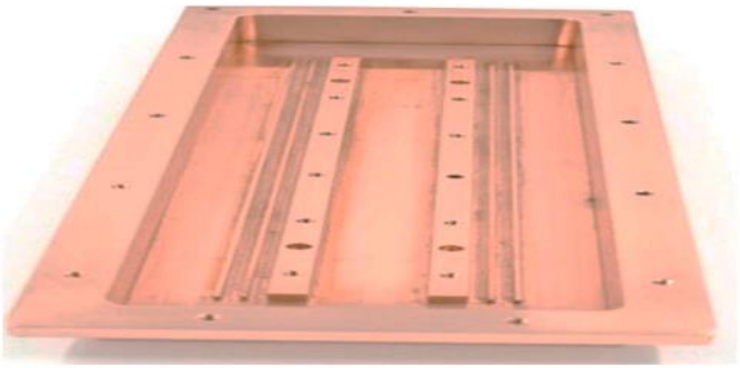

Fig 1. Copper Sheet

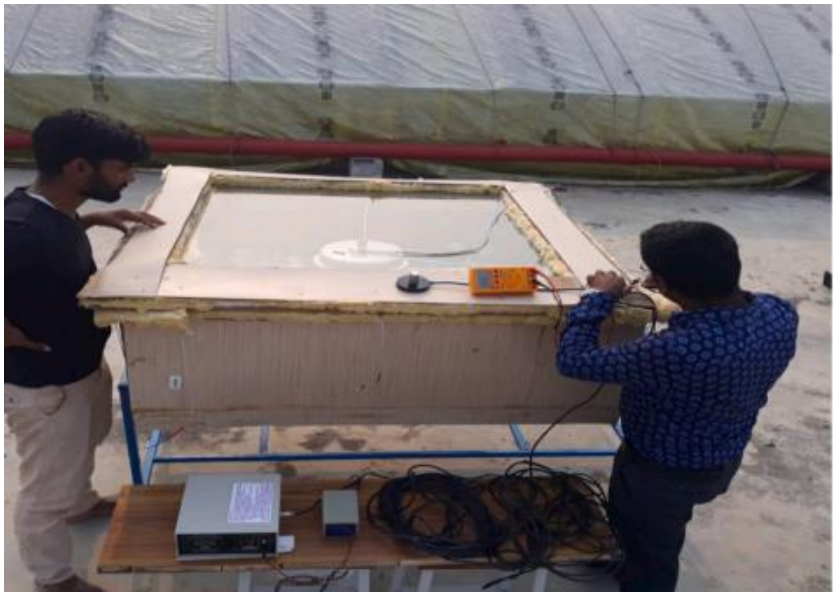

Fig 2. Experimental process

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

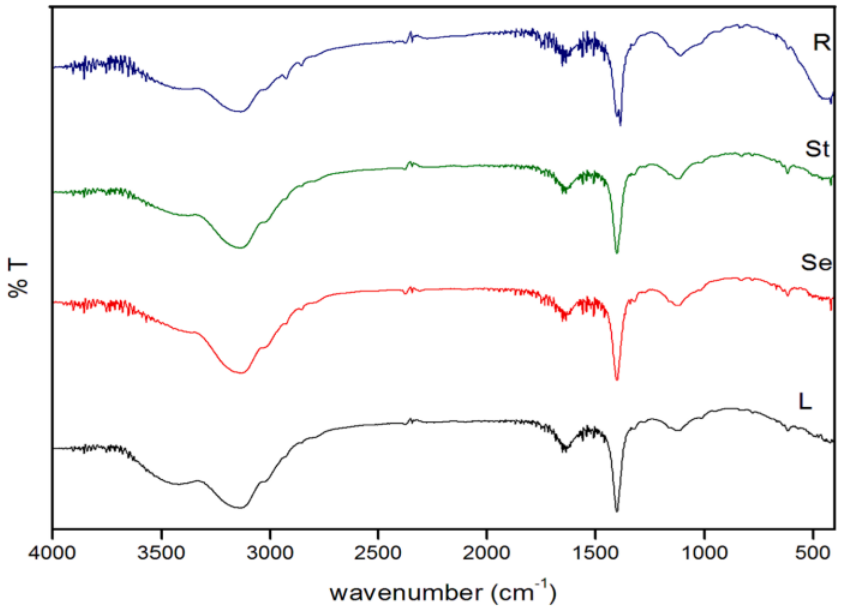

Fig 3. FTIR

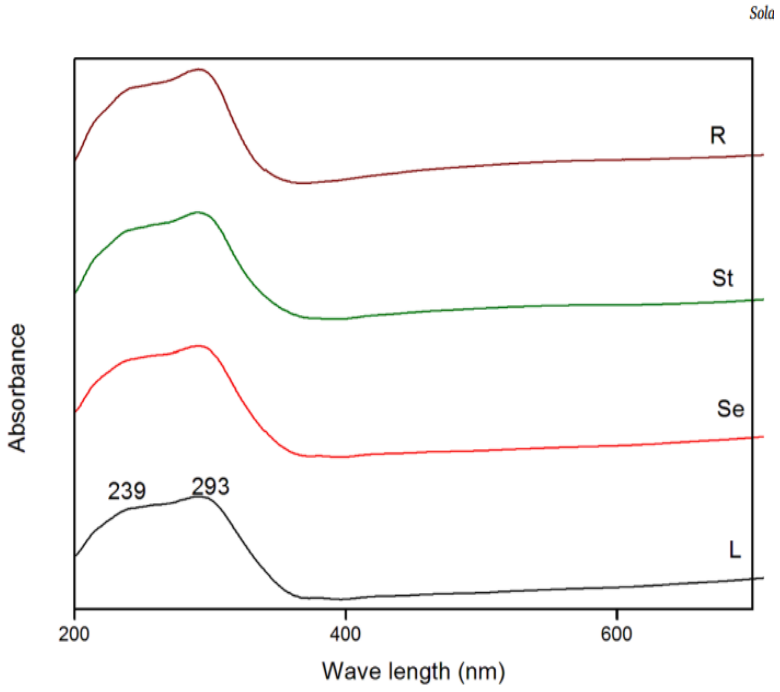

Fig 4. UV-Vis Spectroscopy

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

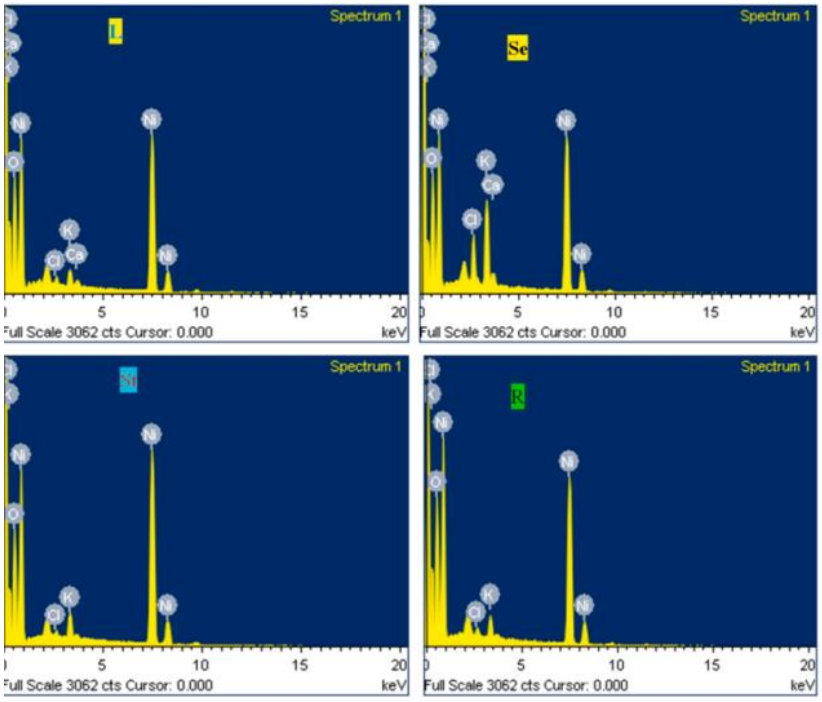

Fig. 5. EDAX images

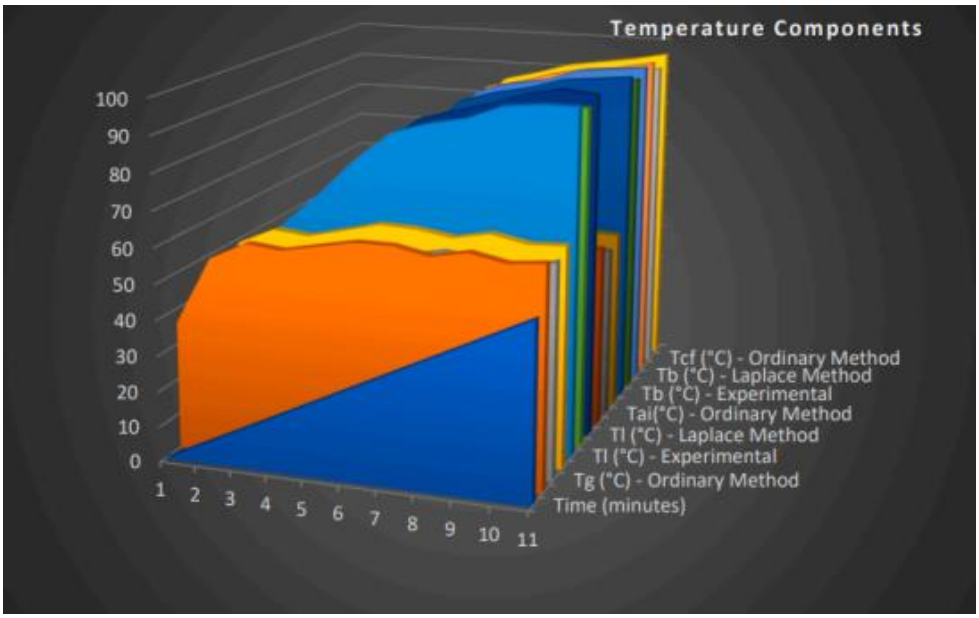

Fig. 6. Temperature elements of the cooker

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

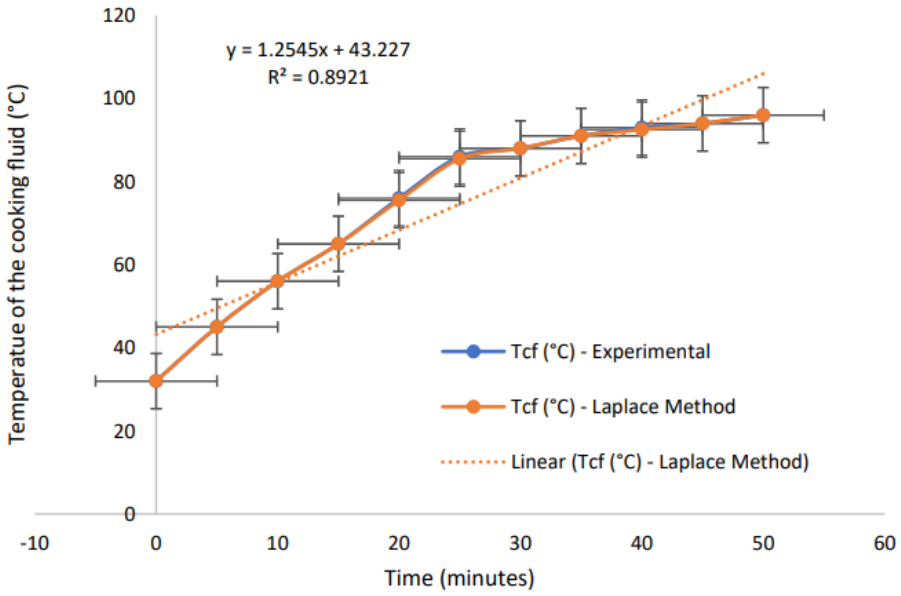

Fig. 7. Experimental and theoretical (Laplace method)

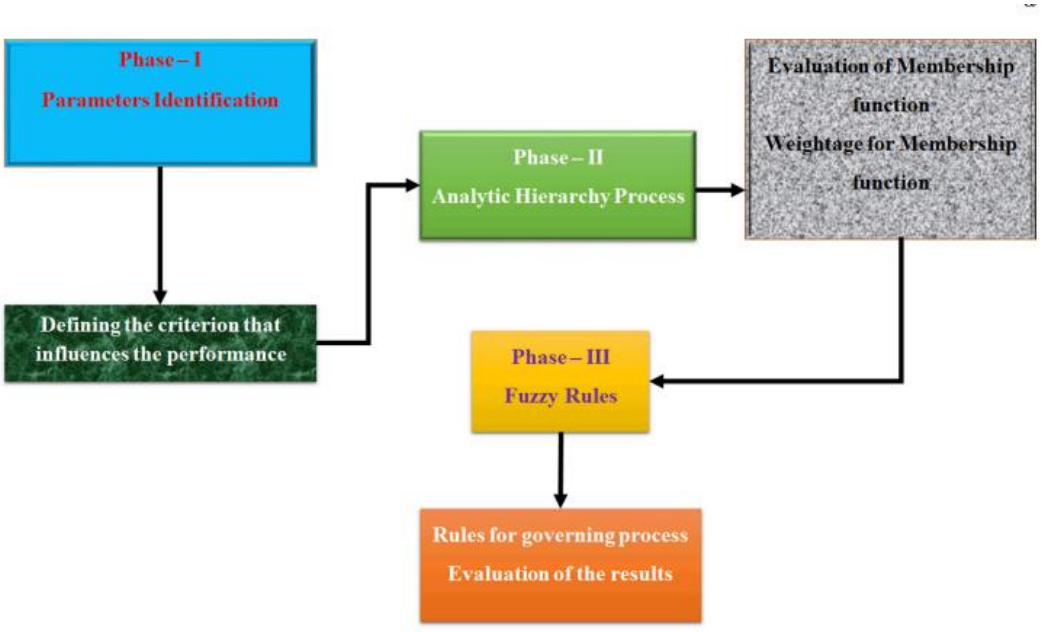

Fig. 8. Fuzzy rules based algorithm.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

Conclusion

The Laplacian method is more efficient and accurate than the for the cooker's temperature components. It is comparable to the outcomes found by Ballestrin et al. (2022) for the solar cooker's stepped bar plate and the performance affected by different parameters The analytical outcomes of this work are comparable to those of Reyaz Arif et al. (2021) for the use of thermal image processing to the cooking process. If the important temperature is understood by utilizing fuzzy rules, the performance of the cooker can be predicted with ease.

Reference

[1] Sunil Geddam, G. Kumaravel Dinesh, Thirugnanasambandam Sivasankar, Determination of thermal performance of a box type solar cooker, Sol. Energy 113 (2015) 324–331.

[2] S. Mahavar, P. Rajawat, R.C. Punia, N. Sengar, P. Dashora, Evaluating the optimum load range for box type solar cookers, Renew. Energy 74 (2015) 187– 194.

[3] A. Saxena, S. Lath, V. Tirth, Solar cooking by using PCM as a thermal heat storage, MIT Int. J. Mech. Eng. 3 (2) (2013) 91–95.

[4] V.S. Hajare, B.S. Gawali, Experimental study of latent heat storage system using nano mixed phase change material, Int. J. Eng. Technol. Manage. Appl. Sci. 3 (8) (2015) 37–44.