



UNIVERSITI  
TEKNOLOGI  
MARA

Kolej  
Pengajian Kejuruteraan

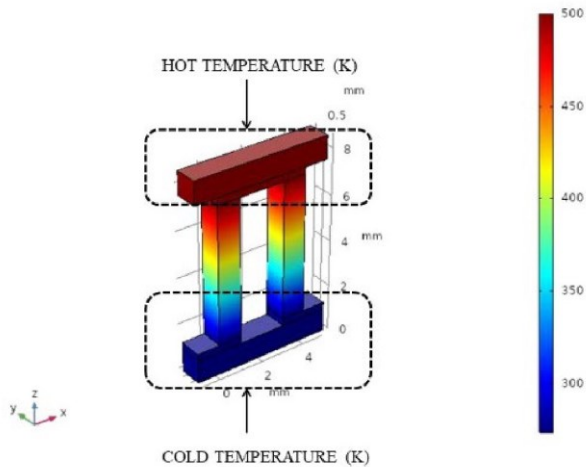
# DIGEST: RESEARCH & INNOVATION

College of Engineering

Volume 2, 2024  
eISSN : 2805-573X



# Exploring High-Temperature Materials for Enhanced Energy Conversion



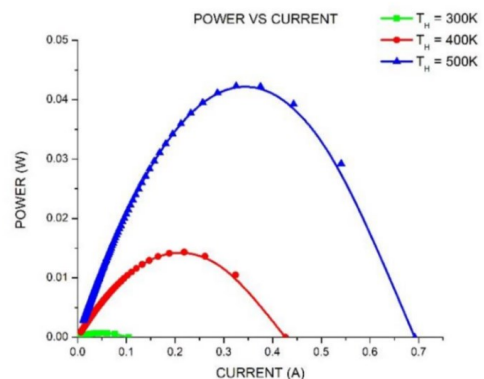
Temperature Distribution on Single Leg TEG

The research was driven by the pressing need to address the global energy crisis and explore sustainable energy sources. Thermoelectric generators (TEGs) offer a promising solution for converting waste heat into electrical energy. However, their efficiency is limited by the performance of the thermoelectric materials used. This research took a unique approach by investigating the potential of materials, specifically  $\text{SrTiO}_3$  and  $\text{Ca}_2\text{FeMoO}_6$ , as alternatives to the commonly used  $\text{Bi}_2\text{Te}_3$  in TEGs. Their excellent thermal and chemical stability at high temperatures makes them attractive candidates for high-temperature TEG applications.

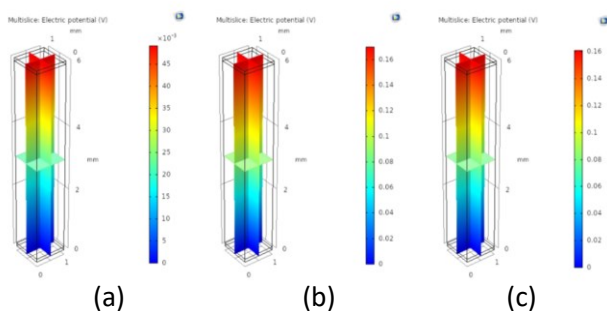
The research involved multiphysics simulations using COMSOL software to model and analyze the performance of single-leg TEGs using  $\text{SrTiO}_3$  and  $\text{Ca}_2\text{FeMoO}_6$  materials.

The simulations focused on studying these materials' temperature distribution, voltage potential, and electrical performance (output voltage and output power) under different hot-side temperatures and load resistances. The results demonstrated that  $\text{SrTiO}_3$  outperformed  $\text{Ca}_2\text{FeMoO}_6$  in terms of power output, which is consistent with its higher figure of merit (ZT).

The significance of this research lies in its potential contribution to developing more efficient and sustainable thermoelectric generators. By exploring alternative materials which can withstand higher temperatures, TEGs could be used in a broader range of applications, such as industrial waste heat recovery and automotive exhaust systems. Furthermore, the successful implementation of high-performance TEGs could lead to reduced energy consumption and greenhouse gas emissions, promoting a more sustainable future.



Power vs Current of different hot side ( $T_H$ ) values for  $\text{SrTiO}_3$ .



Electrical potential distribution to drive a current of 0.7A for (a)  $\text{Bi}_2\text{Te}_3$  (b)  $\text{Ca}_2\text{FeMoO}_6$  (c)  $\text{SrTiO}_3$

Ir. Ts. Anees Bt Abdul Aziz  
School of Electrical Engineering  
[anees@uitm.edu.my](mailto:anees@uitm.edu.my)



Scopus

UiTM  
EXPERT

# Office of Research & Innovation College of Engineering

[penyelidikankpk@uitm.edu.my](mailto:penyelidikankpk@uitm.edu.my)

<https://sites.google.com/uitm.edu.my/research-innovation-office>

