Tab 1

Name: Aadithyaa

Grade:9-3

School:Fairview

Project:Thermoelectric Flashlight Powered by Body Heat

Start Date: December 26, 2024

Day 1: December 26, 2024.

Today I just researched materials to use for my flashlight. I found a few cool things to use such as Li-ion batteries and bridge rectifiers. I created the Slideshow and I have no idea what materials I’m using

Analysis: If I use Li-ion batteries to store energy, my battery could work even without body heat.

Day 2: December 27, 2024

I researched materials more and came up with the idea of using a boost module and using step down module to help step down voltage to store in my batteries. I am also going to use aluminium heat sinks as I find they are the best with heat dissipation.

Day 3: December 29, 2024

I found a thermoelectric module I really like called the TEC1 -12705. It is the same one Ann Makosinski used which helped me in choosing it. I am using that along with a 40mm x 40mm x 20 mm heatsink I found. I plan on placing all 4 along the bottom of the cool side of the TEG and it might help with heat dissipation. I am also going to use a Battery protection module to help with voltage regulation and prevent overcharging of the battery. So far I’m just scanning my options and the most important thing I’ve looked at is the TEM and I will use it.

Day 4: December 30,2024

I generated a basic list of materials I will use. I also studied the Peltier effect and learned about P -type and N -type semiconductors. My TEM utilizes this effect so it is something I have to put in my presentation which I only have 2 slides on. The Title Page and Introduction so I have to add this to my presentation

Day 5: December 31, 2024

Today I learned about Ann Makosinksi and watched her a lot. She emphasized on peltier tiles and I made a slide explaining it. Other than that I didn’t do much. I watched her just to get a base idea on what my flashlight would look like or the similarities between ours.

Day 6: January 2, 2025

Today I went to the store to see if they had any of the materials I was looking for. I went to Home Depot to see if they had a TEM and they didn't, so I went to Best Buy for heatsink. They did but I refrained from buying anything and realized that I needed to update my list first and the heat sinks that I was gonna buy would not dissipate heat well enough.

Day 7: January 3, 2025

I studied human body heat and learned about the fact that your body produces 100 W of power at rest. I also learned that thermoelectric modules are highly inefficient and it was all too good to be true so I looked more into TEMS and realized that they would be inefficient for a thermo-flashlight because they are primarily used for cooling and refrigeration. So I picked a new TEG which is the SP1848 27145 and this is a TEG made specifically to power from heat. And what it does is it utilized the Seebeck effect

Day 8: January 5, 2025

I created a slide on the Seebeck effect and learned that it would be more suited for my flashlight. All other materials would be the same although and I need to make sure that my circuit worked properly in accordance with my body heat and all the requirements

Day 9: January 7, 2025

I scrapped the idea of doing batteries because the whole idea of my flashlight is to work based on body heat. So I removed that, along with the buck down converter and bridge rectifier and the charging module. It cleared up my list and made it more straightforward leading more toward success than confusion which I was this past week

Day 10: January 9, 2025

I added a slide dedicating Ann Makosinksi because most of my project was from her’s besides a DIY Joule thief I am using the XL6009 Boost converter and I don’t wanna make my own Joule Thief even though it is easy because it is extra components and for me I like the adjustability of the module. It increases input voltage to the output voltage

Day 11: January 11, 2025

I created a slide on the Boost Converter and added info on its parts such as its inductor which I learned stores current and passes it through when enough is able to light up the LED.

Day 12: January 13, 2025

I added new materials to my list today and came up with a finished list of a very large heat sink, terminal blocks instead of buying an entire soldering kit and flux pen and a new red LED I found off of DigiKey because it would be compatible with my setup which I think would work with the LED. The light isn’t gonna be super bright which is what I’m stressed about.

Day 13: January 15, 2025

I added my entire finished materials list to the google slides and after that added my building process which I will use on a separate slide.

Day 14: January 17, 2025

With my new materials I finally added my hypothesis and variable to the slideshow and made my hypothesis realistic. I added my variables as Independent, Controlled and Dependent and most of my controlled variables were main components of my flashlight

Day 15: January 20, 2025

I added real life applications to the slide and learned how important TEG’s were, they can be used in space explorations and even military devices. It proves how useful they are when built on a large scale instead of being built small like mine. I’m sure if they build it complex then it will be way efficient but my efficiency rate so far for my project is around 0.0003% and I’m really stressed right now

Day 16: January 22, 2025

Today I am on another level of stress because I calculated the flashlight and realized that it might not even work with my LED if the efficiency is so low. There isn’t much I can do right now because it's due soon and if my project won’t even work I’m stressed. So I did calculations again and realized that the boost converter is actually giving a 70% so the usable power is 449.8μW \* 0.7 = 314.86μW copied from my calculations. The voltage is 3.4mV but the boost converted will boost that up to the required 1.8V of forward voltage required for the LED.

Day 17: January 24, 2025

I just finished a lot of slides, one was a table comparing batteries and TEG’s and another talked about how bad batteries were. I just finished my script for both those and for another slide I made on the difference between TEGS and TEMS

Day 18: January 26, 2025

I made a script on the real life applications slide and tried to make my slides legible and concise and avoid making them look boring and basic. Some did have a lot of words but I tried to balance it out

Day 19: January 28, 2025

I bolded words I thought were important and added pictures to some slides. The due date was extended from Jan 27 - 31 so it's good for me. I added my citations APA because it is science related and put them into the last slides. I made a conclusion summarizing my project and tried my best to fit a lot of info into that one paragraph

Day 20: January 29, 2025

I added possible sources of error as a table and how I fixed them. I went in depth about my choice of LED and why it is compatible with my setup unlike most LED’s I found. I also thought of hard questions people might ask me for a Q&A and chose the last question, also probably one of the most common questions and decided to answer it on my recording.

Day 21: January 30, 2025

Today was a busy day because I made my project blueprint on Tinkercad despite not having any options I still tried. I used Tinkercad to build my circuit and it took me around 3 hours. <https://www.tinkercad.com/things/7iQa7MuGvPT-thermoelectric-flashlight-circuit>

Day 22: January 31, 2025

Today I worked on recording my project all in one go hopefully. Since it is 15 minutes I don’t have a lot of time and am trying to aim closer to 10 minutes to be safer. My script only covers 4 slides so most of them will be me reading and trying to put knowledge into the slides. I will try it in one go. This is my plan. I will buy the materials once I get into the science fair. Edit. It is 11:30 PM and the project is due in 20 minutes. I just finished recording. It took me around 7-8 tries. I decided to screen record because I wasn’t able to connect my chromebook to the TV. Today I will submit my logbook along with my presentation. I will still work on this everyday

In conclusion I think I did well throughout the entire thing. I learned a lot from this and some key things I learned along this project were the Seebeck effect and how a temperature gradient results in a heat flow. I also learned about how important a heatsink is and why it is important to have a heatsink larger than your TEG