SUSTAINABLE HOUSE

Introduction

Property of material, Steel (metal) is conductor, terracotta is insulator. Metal is better in conducting heat, the electrons in metals can move around easily, and they can carry heat from one part to another. Terracotta is more of a strong thermal insulation, it doesn't conduct heat that well because it does not have similar properties as metal. Metal is very dense in comparison to terracotta or foam, so it insulates heat well. Foam insulation doesn't conduct heat well because heat cannot flow through them and they have small bubbles trapped inside them, making them work more of an insulator than a conductor. Aluminium is good in retaining heat but it is better in conducting heat.

Research Question

Does the thermal conductivity of different materials affect their ability to retain heat over time?

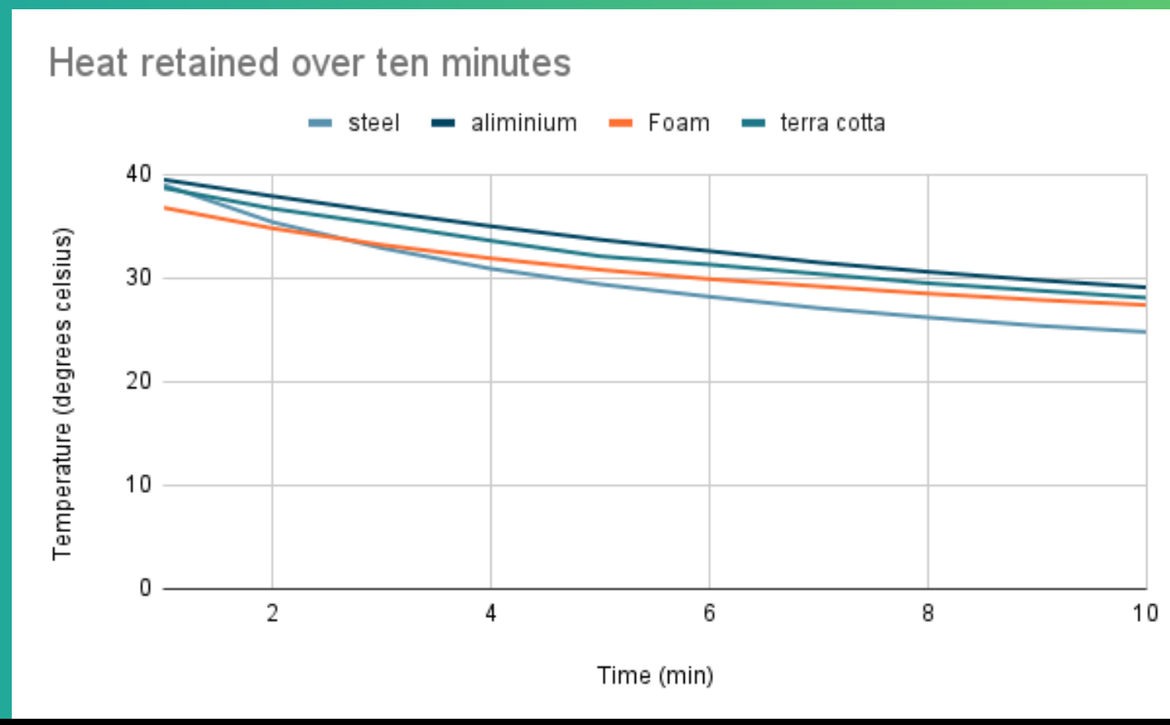
Hypothesis

If we use aluminium then it will retain more heat than the other materials because it will block heat in.

METHOD

First we set up the house, the heat calculator and the light (On 12 volts). Then we got our materials and put the first material into the house (two sides of the material, one plastic panel and a temperature sensor, insulation panels on the floor and one piece in between the roof and the base, two on the outside of the roof). We heated up the house to 40 degrees and then shut the light off. We recorded the heat every minute for 10 min (including starting temp). We took out the materials and let it cool down and then repeated for three other materials.

Graphs



Materials

1. Aluminium passive heat resevoir
2. Steel passive heat reservoir
3. terracotta tile
4. insulation panels

Percentage of Heat lost/decreased in 10 minutes

Phr Steel = 14.2 degrees /40 x100% = 35.5% degrees lost
Aluminium = 10.4 degrees / 40 x 100% = 26% degrees lost
Foam Insulation = 9.4 degrees / 40 x 100% = 23.5% degrees lost
Terracotta tile = 10.6 degrees / 40 x 100% = 26.5% degrees lost

Discussion

The data we received shows the thermal conductivity of different materials at different temperatures. Steel has the lowest heat retaining setting among out of the other materials, with the heat at 24.8 degrees at 10 minutes. Foam insulation has the second last temperature at 27.4 degrees in 10 minutes. Aluminium and Terracotta tiles have similar power of thermal conductivity, terracotta with a heat of 28.1 degrees but aluminium has a higher value of retaining heat than the others. Aluminium Phr had the highest heat at the end of 10 minutes at 29.1degrees , 1 degrees better than terracotta tile, showing that aluminium Phr is better at retaining heat than the other materials that we have tested. We also did this experiment to show that it is also important to study about what material is good in thermal conductivity which also helps in future experiments and assignments. Every material has different uses and different type of properties, by changing to different materials we can find what they are more suited for and more useful with, it might also change the results of the experiment which shows how important the independent variable is. There can be different types of experiment where you find how fast certain materials heat up depending on their heat conductivity. There could also be where would the material be needed depending on the question like would the house heat up faster with no windows or with windows etc. The first experiment that we conducted did not meet the standards that we were hoping for, so we conducted another experiment with a better question that we felt would fill our needs for this experiment better. Our results were interesting because the materials we used acted differently from what we thought. But our hypothesis was half correct, with the thicker steel not working well as a heat retainer, but the thinner aluminium working extremely well as the best heat retainer.

Conclusion

In conclusion, the data that we received demonstrates and shows the varying thermal conductivity of different materials in retaining heat. Phr Steel had the least heat in retaining heat , making it a defective material for retaining heat. Foam insulation had a higher setting in retaining heat than the steel, but it is also not that great in retaining heat. Phr Aluminium and terracotta were similar in retaining heat, but aluminium had a better setting in retaining heat than terracotta by a little bit. Understanding the power of retaining heat in materials is pretty important for making decisions in applications such as building insulation and heat transfer