CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Joseph C.F. Adams

Project Number

J1301

Project Title

Can You Hear Me Now? A Project on Acoustic Physics with Household Materials

Abstract

Objectives/Goals

A sound wave is the pushing and pulling of air, creating vibration and projecting it. The human ear receives these #waves# of vibration using the eardrums, and sends signals to the brain to interpret. I did an experiment on how well different materials can project these sound waves. The question I asked was which homemade speaker design would produce the loudest sound in decibels.

Methods/Materials

I gathered materials to make an array of speakers using the same design, but using different materials to actually produce the sound. The tested materials included potato chips, bubble wrap, styrofoam, cardboard, and rigid plastic. All speakers used a stack of cylindrical refrigerator magnets, magnet wire, and glue. I played the same song from a boombox for a 30 second timespan using each speaker. Using a sound level meter, I took measurements to determine the average, maximum, and minimum sound pressure levels to see which produced the loudest sound. For comparison, I also tested a similar sized commercial speaker, removed from an old bluetooth phone speaker.

Results

My measurements determined that the styrofoam speaker consistently produced the highest average, maximum, and minimum sound pressure level of any of the homemade speakers. The average sound pressure level for the styrofoam speaker, for example, was 59.3 dB. This is significantly higher than that of the cardboard speaker (55.7 dB), the plastic speaker (52.3 dB), or the Pringles potato chip (51.3 dB). The commercial speaker produced a significantly louder sound than any of the homemade speakers. Qualitatively, though, the homemade speakers seemed to produce better sound quality, particularly at the high frequencies, compared to the commercial speaker.

Conclusions/Discussion

I can make loudspeakers out of household materials, but they are much quieter than a commercial speaker. My hypothesis was proved correct, in the sense that the speakers worked, but incorrect, in the sense that the styrofoam speaker performed better than the plastic speaker.

Summary Statement

I constructed loudspeakers out of household materials, tested the acoustic properties of those speakers, and determined which materials produced the loudest sounds.

Help Received

I did the experiments myself with some help from my parents. They helped with the hot glue gun during construction and by starting/stopping the music during data collection.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Cyrus Amalan; Michael Rose

Project Number

J1302

Project Title

Sound Extermination

Abstract

Objectives/Goals

The objective of this experiment is to measure and compare two different sound frequencies once the materials are put in front of it.

Methods/Materials

Acoustic foam (2¡± x 12¡± x 12¡±), Circular Glass (7 in. Diameter), Silicone rubber (#û inch thick), Plastic Jar (8 in. Length), and two speakers to expose the sound. We made our own powerful speaker and we also had to solder the wires to the speaker.

Results

The results matched most of the hypothesis. The acoustic foam was the best for soundproofing because of its soft but strong properties. The hypothesis was wrong because the foil would do better, but it was one of the worst material for soundproofing. The foil did not do so well because it was not a stronger source of metal and not sturdy enough to withstand the sound frequencies tested with. The #û of an inch rubber did very good when it was tested for 10,000 hz but in 20,000 hz it was not the best in soundproofing. The rubber did bad in 20,000 hz because it was not dense enough to withstand the soundwave force.

Conclusions/Discussion

Most of the results supported the hypothesis. The acoustic foam would be the strongest for soundproofing because it is made of lightweight and strong compounds. The aluminum foil would be good for soundproofing but the hypothesis was wrong. The aluminum foil was actually the worst material for soundproofing probably because of its very thin and lightweight design and not sturdy enough to withstand a sound frequency of 10,000 Hz and 20,000 Hz.

An issue that could have happened during the testing phase could be a wrong setting that was put on the sound frequency level meter. Another issue that could have happened is if the converted data from Hz to Db went wrong but each material was tested 5 times for each sound frequency so most likely the results would be correct.

Summary Statement

My experiment is about how sound travels through substances.

Help Received

I customized a speaker an dI also had to solder the two wires to the end of the speakers. My science teacher checked over our work to make it better and improved.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Alec A. Balandin

Project Number

J1303

Project Title

How Does Graphene Implanted in Thermal Paste Affect Its Heat Conduction Properties?

Abstract

Objectives/Goals

I wanted to learn how graphene could affect the heat conduction properties of commercial thermal paste, and understand if graphene can be used for improving heat removal from computers.

Methods/Materials

I used commercially available solution of multi-layer and single-layer graphene and thermal paste to prepare composites with graphene. To measure the thermal conductivity, I used the "Hot Disk" and "Laser Flash" techniques. The concentration of graphene in the thermal paste was independent variable. The thermal conductivity was measured at different temperatures.

Results

My results have shown that addition of single-layer and multi-layer graphene increases the thermal conductivity of the commercial thermal paste from 1 Watts per meter per Kelvin (W/mK) to 35-50 W/mK. This supports my hypothesis that graphene would increase the thermal conductivity of the thermal paste. I found that multi-layer graphene in composites produces stronger effect than single-layer graphene. I also observed that the thermal conductivity of the thermal paste with graphene increases with temperature.

Conclusions/Discussion

My hypothesis was supported by the experimental data. The thermal conductivity of composites with graphene increased. This improvement can be explained by excellent thermal property of graphene and its good mixing in composites. This project expanded our knowledge of thermal properties of composites with graphene. The results suggests that commercial thermal pastes can be improved by adding graphene. This method can possibly innovate computer and cell phone technologies by preventing overheating of the electronic components inside the gadgets.

Summary Statement

The project demonstrated that atomically-thin graphene can improve heat conduction properties of thermal paste and facilitate heat removal from computers.

Help Received

I used equipment for mixing composites and measuring thermal conductivity in the University of California # Riverside. My mentor was Fariborz Kargar, Research Assistant and PhD Candidate.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Faith J. Bray

Project Number
J1304

Project Title
How Many Volts Does It Take to Light Up Different Thickness of Pencil Lead?

Abstract

Objectives/Goals
The objectives of this study was to find out how many volts it takes to light up different thickness of lead. This led to a second objective. My second objective was is amperage more important than voltage.

Methods/Materials
.5 mm, .7mm, and .9mm HB pencil lead, D-cell batteries in a series, 9 volt batteries, volt meter, and amperage meter. I started at 1 battery and continued to add batteries until each pencil lead glowed brightly. I used the voltage meter to see how many volt were being used to light the lead. I used two 9-volt batteries in parallel, and one 9-volt battery by itself to show amperage, using the amperage meter.

Results
I took the 3 different size lead, and used the D-cell batteries in a series to light them up. It took more volts to light the thicker lead. I thought I was done until I tried to recreate my results using different batteries. I tried using 9-volts batteries but it wouldn't light the thinnest of lead, and it should have. This led to my second hypothesis, which is amperage is more important than voltage. Using two 9-volts in parallel, I lit up the thinnest lead.

Conclusions/Discussion
My conclusions were what I expected at first. The thicker the lead. The more voltage it took to make it glow, but I learned how fast things can change in an experiment. When I tried to recreate my findings using a different size battery (9-volt). It didn't work. I had to find out why. I did some research, and I came up with my second hypothesis. Amperage was more important than voltage in making the lead glow. This was confirmed.

Summary Statement
I found it took more volts to light up the thicker lead, which led to a second experiment on voltage versus amperage.

Help Received
I designed and performed the experiment myself, after seeing something similar on Hack My Life. I had help building the display by Troy Bray. I used internet searches to get information on my subjects (voltage,light bulbs,batteries, and amperage)

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Katherine G. Champness

Project Number
J1305

Project Title
The Effect of Rapid Temperature Change on Protective Coatings

Abstract

Objectives/Goals
The objective of this study is to determine the impact rapid temperature change has on protective coatings.

Methods/Materials
Ice, Water, Bucket, Lab, Oven, Gloves, Safety glasses, Infrared Thermometer, 8 - 3mm x 25mm x 200mm steel plates with fusion bonded epoxy.

Results
The coated plates were heated from ambient temperature to a prescribed temperature. Once the plate reached this temperature the coated plate was immediately placed in ice water. After a series of trials the coating did not demonstrate failure.

Conclusions/Discussion
The data did not support my hypothesis. Rapid temperature change did not effect the coating ability to protect the substrate. However, the coating performance did fail due to extreme temperature rather than rapid cooling.

Summary Statement
I showed that rapid temperature change did not effect the protective coating, however high temperatures degrade the coating.

Help Received
My cousin provided the coated plates and supervised me while conducting the experiment.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Dominic Eftekharzadeh; Lorenzo Ramos; Nicholas Tudor

Project Number

J1306

Project Title

The Coolest Apparatus

Abstract

Objectives/Goals

Our goal is to find a way to make a practical cooling apparatus used for recreational and military uses that cools down a person's body.

Methods/Materials

1. Plastic tubing (thin walled/silicone)
2. Felt material
3. Plastic boarding
4. Filter media
5. Hand pump
6. 12V-18V batteries
7. Compact fan
8. Silicone
9. Hot glue (and glue gun)
10. Sports mesh
11. Water (colored)
12. PVC piping
13. Thermometers (temp. and humidity)
14. Marker

Results

Using cooling properties of both air and water, an apparatus that can come in direct contact with a warm body can effectively transfer heat to the water where it is cooled by air that takes the warmer water out of the apparatus and leaves cooler water that can be used again.

Conclusions/Discussion

In our experiments with our cooling apparatus, we looked for a way that could quickly stabilize a person#s body temperature so that they were comfortable in warm environments and cooled under strain.

Summary Statement

Our project is a wearable cooling unit that cools down the human core.

Help Received

We received help from an environmental scientist, who supplied us with equipment used during the project.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Allison Hartsell

Project Number
J1307

Project Title
Heat Retention Levels of Woods

Abstract

Objectives/Goals
The objective of my experiment was to understand what type of wood would be best for a home in a cold region. I tested which wood had the best heat retention to see which wood would keep a house warm the longest. I predicted that a hardwood would have the best heat retention due to it's density.

Methods/Materials
My procedure for this experiment is simple: I heated my woods at the same time at 250°F for 20 minutes, Next I placed each one in a individual jar with a thermometer, Then for an hour I checked the temperature every 5 minutes and recorded my data. My 6 woods were: birch, maple, poplar, oak, cedar, and pine.

Results
After my experiment I found that pine, a softwood, was the best heat retainer. That proves the opposite of my hypothesis. Hardwoods were poor at heat retention because their density prevented the heat from fully absorbing. Therefore, the heat was released faster. However, I realized that my other softwood, cedar, was the WORST heat retainer. I discovered that this was because cedar was very porous so heat was released faster.

Conclusions/Discussion
I learned what types of woods would be best for houses in cold regions to keep heat in better. I also learned that the worst heat retainer would be best for decks to prevent the deck from over-heating and being to hot under foot. From the six woods I tested the best wood for houses would be pine.

Summary Statement
I tested the heat rentention of six types of wood in order to see which one would retain heat the best and therefore be a good home construction material.

Help Received
Susan Wright (science teacher helped with layout of board) Carl Gong (retired teacher, helped with how to conduct the experiement to get accurate results. Helped me to understand the problem with the cedar)

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Loden J. Haught

Project Number
J1308

Project Title
Sound Dampening

Abstract

Objectives/Goals
The objective was to measure the desiples the speaker amplifide with the different materials from inside a box.

Methods/Materials
Testing the difference between different materials (towels, blue jeans, bubble wrap, and card board) with in a outer box that is 2x2x2 and a inner box holding the speaker that was being messurd by a desible messure on my phone.

Results
Sevral tests were messured for every material inside the box to conclude the decible diference between the empty box and filled boxes. The final result was the towels with a 53.12 deciple difference.

Conclusions/Discussion
several tests were made to show that house hold material can sound proof and is a good alternative sorce for insolating.

Summary Statement
I made a box to hold different house hold materials to determen the decible difference between the empty box and material filled box.

Help Received
My dad helped build the box, but other than that i did the whole progect by my self.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

T. Alden Ingelson-Filpula

Project Number

J1309

Project Title

Tensile Strength of Biobased Polymers (Bioplastics)

Abstract

Objectives/Goals

To determine how different biomass-based components in the manufacture of biobased polymers (bioplastics) affect tensile strength.

Methods/Materials

A variety of biomass-based agents including tapioca root, corn starch, potato starch, rice starch and agar were used as the base biological components for each bioplastic sample. Following manufacture, the bioplastic samples were tested to determine their tensile strength. The area and dimensions of each sample were kept consistent (controlled), and tensile strength tests were performed utilizing a spring scale.

Results

Tensile strength (calculated in KPa) proved to be highest in the agar-based bioplastic, averaging over 200 KPa. While quantitative results were obtained for the other samples, it was interesting to note that the properties of the corn starch-based bioplastic rendered it untestable. By combining agar with the starch-based components, tensile strength increased. Overall, the agar-based bioplastic appeared most similar to commercial petroleum-based plastics with respect to physical properties and high tensile strength.

Conclusions/Discussion

The appeal of biobased polymers, or bioplastics, as an alternative to petroleum-based plastics has increased in recent years. This is largely in response to the ever-expanding demand for commercial plastics, and greater awareness of the detrimental environmental impacts petroleum-based plastics pose. By determining how different biomass-based components affect tensile strength, manufacturers can better control the ability of bioplastics to perform at equal or greater levels than traditional petrobased plastics. Given the tensile properties of the agar-based bioplastic, expanded opportunities for the use of this renewable biodegradable plastics may result.

Summary Statement

My project measures tensile strength in different biobased polymers (bioplastics), to determine which may best be utilized as an alternative to petroleum-based plastics.

Help Received

I designed, manufactured, and tested the bioplastics myself. I initially required guidance from my father using the formula to calculate tensile strength.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Cassia A. Jones

Project Number
J1310

Project Title
Future Fabrics: Using Carbon Nanotube-Coated Cotton to Create Efficient Wearable Heaters

Abstract

Objectives/Goals
Keeping people warm is a worldwide problem. With my project, I attempted to create an efficient heating device made from cotton strips saturated with a solution of carbon nanotubes. When dry, this creates a wearable fabric that can produce heat when electricity is passed through it. When electrons pass through the jumble of carbon nanotubes, they create vibrations in surrounding molecules, which creates heat. The treated fabric retains its normal traits, such as softness and flexibility. My hypothesis is that I can make an efficient heater out of cotton coated in a solution of carbon nanotubes, sodium lauryl sulfate, and water.

Methods/Materials
For my project, I dipped 4 cm x 2 cm strips of cotton in a solution made from water, 1.5 mg/mL multi-walled carbon nanotubes, and 10 mg/mL sodium lauryl sulfate. The sodium lauryl sulfate was to keep the carbon nanotubes from clumping together. After dipping the samples multiple times, I dried them in the oven at about 120 degrees Celsius and tested their resistance with a multimeter. If the cotton sample had the appropriate resistance, I tested its ability to generate heat by running 30, 40, or 50 volts of electricity through it using a regulated power supply. I recorded the temperature of the fabric every thirty seconds using a digital thermometer for five minutes and for 2 additional minutes after turning it off.

Results
By dipping my samples multiple times, I was able to lower the resistance from over 60 mOhms to less than 10 kOhms. After preparing my samples, I tested my samples at 30, 40 and 50 volts with currents of about 0.002 amps. When connected to power, the samples heated up rapidly to over 50 degrees Celsius despite using only about 0.1 watt of power. They also cooled down very quickly.

Conclusions/Discussion
Carbon nanotube-coated cotton is highly efficient in producing heat (up to 52 degrees Celsius), has low resistance (less than 10 kOhms), and is suitable for wearing. Treating cotton with carbon nanotubes only requires a simple water-based solution and easy dipping methods. Treated cotton still remains soft and flexible. Carbon-nanotubes bind tightly to cotton fibers and do not easily rub off. The resistance of the dipped cotton can be lowered through multiple dippings. The lower the resistance, the higher the heating temperature of the sample.

Summary Statement
My project is about creating an efficient, wearable heater made from cotton dipped in a solution of carbon nanotubes.

Help Received
My father provided me with the necessary supplies for the project as well as showed me how to preform the procedures safely. My grandfather suggested the idea for the project.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Seney Larson Moreno

Project Number
J1311

Project Title
The Effect of Acid Rain on Construction Materials

Abstract

Objectives/Goals
The objective of this study, is to determine which construction material best withstands the effect of acid rain.

Methods/Materials
15 2x2 inch samples of construction materials per test set, 3 test sets including a control group, were exposed to two pH solutions made from vinegar and water,and were sprayed 3 times a week and measured weekly.

Results
Sample data had to be normalized since sample weights were different. Using the average weekly percent mass changes, standard deviation, and observations, I determined that the best materials were granite and marble. Wood samples and metal samples had significant visible damage as a result of natural rain, which was an uncontrolled variable. The original hypothesis was disproved.

Conclusions/Discussion
Damage by rain was unexpected and proved to be the most significant. For some samples, damage caused by natural rain was heightened by the presence of acid, while for others, like granite and marble, the least affected materials, there was no measureable effect. A longer duration of testing or stronger acid solutions are necessary to differentiate the effect of acid solutions and moisture (rain) on these materials. Additionally, material cost and possible barreier finishes need to be considered.

Summary Statement
As measured by standard deviation and averaged percent mass changes, a six week exposure to mild acid solutions is not long enough to accurately differentiate material properties.

Help Received
I got help from my dad in cutting samples, and my mom taught me how to use excel.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Marta K. Olson

Project Number
J1312

Project Title
Conductive Paint: Can You Resist?

Abstract

Objectives/Goals
Conductive Paint is paint that can conduct electricity. You can make it using graphite powder and glue. The purpose of this project is to create a conductive paint that works well on fabric and has low resistance.
My hypotheses:
If the ratio of graphite to glue is higher, then the resistivity of the conductive paint will be lower and it will be more brittle.
If the conductive paint is made using acrylic paint, then the resistivity will be lower than if I used the other glues.

Methods/Materials
In this project, I tested six different glues and three ratios. I tried to find the resistivity of each mixture. In my first test, I used troughs to create a known shape, and still let the glue fully cure. Some of the glues pulled away from the foil ends, so my measurements were inconsistent and probably inaccurate. In my second test, I painted the conductive paint on fabric and wood. I was able to calculate an approximate resistivity.

Results
According to my first test, the acrylic paint samples had the lowest resistance. But in my second, more accurate, experiment, the Liquid Tape was the better material. It had the lowest resistivity and was more flexible than the other materials. Higher ratios of graphite had lower resistivity.

Conclusions/Discussion
If you are using conductive paint, the best recipe according to my tests, is the 7:10 ratio (graphite to glue by weight) with Liquid Tape as the glue.

Summary Statement
In this project, I tested different mixtures of powdered graphite and types of glue to develop an electrically conductive paint with low resistivity.

Help Received
I did not receive any help. I designed and performed my experiments on my own.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Johnny Perez

Project Number
J1313

Project Title
The Effect of Material on Sound Absorption

Abstract

Objectives/Goals
My project is about the effect of material on sound absorption. I believed that cotton would absorb the most sound, because it is thicker and more dense. I found some research that led me to believe more dense materials would absorb more sound. I performed my experiment by placing one of my materials on a blue tooth speaker and recorded how much sound the sound meter measured. My results have shown that sheet rock with fiber glass absorbs the most sound with an average of 35.90 (db). It is 8.47 (db) quieter than without a material, which averaged at 44.37 (db). According to the data I collected, my hypothesis was incorrect. One problem I had when performing my experiment was getting the sound meter exactly on zero because it would always register some sound. My project is useful in everyday life, because my results can be used to make noise absorbing walls for music and audio purposes as well as for quiet homes.

Methods/Materials
I placed a boom box on the ground and set the volume to eight. I set the sound meter five meters away from the boom box. Next I turned on the boom box and attached the material in front of the speaker. I played the sound and recorded the sound level in db. I repeated this 30 times for each material.

Results
The control group, using no material to block sound, had a sound level of 44.4 db. The less dense materials of cotton, polyester, bubble wrap and cardboard, averaged 40-43 db. The more dense materials of fiberglass, sheet rock, glass and a combination of fiberglass and sheet rock, averaged 36-39 db.

Conclusions/Discussion
My hypothesis was not supported by the data because the results have shown that sheet rock with fiberglass absorbs more sound than cotton. If I was to do this experiment again I would make these changes: perform my project somewhere quieter and make sure no one is present, but myself and my supervisor. I would also like to test other combinations of materials such as two panes of glass. My project is useful in everyday life, because my results can be used to make noise absorbing walls for music and audio purposes as well as for quiet homes.

Summary Statement
This project is about the effect of different materials on sound absorption.

Help Received
Mom helped cut some of the materials to size (fiberglass and cardboard).

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Nicholas A. Perez

Project Number

J1314

Project Title

Silica-Based Engineering to Solve Thermodynamic Threats to Wildland Firefighters

Abstract

Objectives/Goals

My objective is to extend the time of the current Nomex fire suit#s ability to protect firefighters from permanent damage due to exposure from direct flames and high intensity heat. My goal is that this new fire suit will give firefighters that additional time they need to deploy their fire shelter since it currently takes 30 seconds to deploy but the current fire suit allows only 14 seconds of protection.

Methods/Materials

I combined different fabrics to make a wearable suit that can be worn by firefighters. I built several frames from fire resistant wood composite and hung the various fabrics on the frames. I used a 1400°F+ propane torch to apply heat to one side of the test suit fabrics and on the other side I used a digital laser thermometer to record how much heat penetrated the suit fabrics. I recorded the time and temperature of each suit fabric as well as any physical changes in the fabrics itself. The test was designed to last 5 minutes because an able bodied firefighter can either self-rescue or get into their fire shelter in that time. Independent variable was the different fabrics: Nomex (knitted, magna, twill), silica fiber, cotton, polyester, and fiberglass welder#s tarp. Dependent variable was the time of fire and heat resistance. Controlled variables (constants) included: propane torch, measurement tool (laser digital thermometer), construction materials and time exposed to open flame.

Results

The best fire suit was a combination of fabrics in a specific order to address the different types of heat. The use of two different types of silica was the key to prolonged protection for the user without suffering any long term effects of exposure to direct fire and heat. The suit surpassed the 5 minute goal.

Conclusions/Discussion

Silica has the ability to be an insulator and shield from direct flames without burning. The use of silica in heat and fire behaves as latent heat. Silica not only kept the fabrics from burning but also reduced the heat that it allowed to penetrate, letting the other fabrics# ability to work as insulators without burning. Surprisingly, silica changed in appearance over time in the presence of a constant source of heat energy. As time passed, the silica changed its appearance and its ability to insulate from fire and heat. The data showed silica allowed heat to penetrate in plateaus, and not in a constant heat rise.

Summary Statement

The best fire suit uses silica-based engineering to combat direct flames and conduction heat.

Help Received

Henry Modregon (OSHA trained)-executed all the hard to handle testing procedures. Leslie Perez-proofread graphs and tables. Katteleine Guillaume sewed prototype

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
G. Dalton Robinson

Project Number
J1315

Project Title
Thermite Reactions: A Comparison of Iron and Copper Oxides

Abstract

Objectives/Goals
To observe two different thermite reactions and determine whether copper oxide or iron oxide thermite would cause more observable damage (melting) to the test subject (made of plastic and metal); and to measure the duration of combustion of copper oxide and iron oxide thermite.

Methods/Materials
The reactions were conducted outdoors on a gravel driveway, cleared of flammable items in a 30 foot diameter circle. A welding mask was used to protect my eyes from the UV rays. A terra cotta flower pot was used to contain each reaction. Molecular weights of iron oxide and copper oxide were calculated and 0.1 mole of each was reacted with aluminum powder and the test subject. Three trials for each type of thermite were completed.

Results
Iron thermite clearly caused more observable damage to the test subject with extensive destruction noted in all three trials. In addition, the iron thermite reaction time was much longer, averaging 21 seconds compared to the <1 second duration of the copper oxide thermite. The copper thermite caused extensive superficial damage, without melting the test subject.

Conclusions/Discussion
The iron oxide thermite reaction led to more observable damage to the test subject and therefore would be more valuable in applications requiring melting of materials. In addition, the longer duration of reaction for the iron oxide thermite would give more opportunity for the reaction to be controlled than copper oxide thermite, therefore likely to be safer to use by personnel in a field situation.

Summary Statement
I demonstrated that iron oxide thermite caused more destruction and melting of the test subject (a plastic and metal object) and a longer duration of reaction than copper oxide thermite.

Help Received
None. I researched the topic, designed the experiment and performed the experimental trials by myself.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Christopher J. Rodriguez

Project Number

J1316

Project Title

What's the Coolest Turf?

Abstract

Objectives/Goals

The objective of this project is to find an infill and/or turf backing that is the coolest. This research can be used for football, soccer, and other sports fields in the future, instead of the extremely hot, and extremely toxic rubber infill that is commonly used now a days.

Methods/Materials

For my experiments, I used multiple turf of samples about 100 square inches, and filled each one of them with the same amount of the different infills available. I placed each of them under the Sun at the same time and place a recorded the temperatures in 20 minute intervals over 2 hours using an digital thermometer.

Results

Many tests were conducted under the sun to determine which type of infill and/or turf backing stayed the coolest. After conducting the tests, I realized that the type of infill, and the backing of the turf directly affected its temperature.

Conclusions/Discussion

The results of my experiment show that the soy backing on the turf samples keeps the turf cooler then what is regularly used. Also, the pet non-odor infill and the sand infill kept the turf cooler than the other types of infill. This data shows that if owners of sports fields are going to use turf, then they should use turf with a soy backing, and use sand infill and pet non-odor infill for the fields.

Summary Statement

I demonstrated what the effects are of using different types of infill and backings on artificial grass when put under the Sun.

Help Received

Jose Melgoza, a certified youth soccer coach, Gave me the idea for the project, what materials I should use, and how to preform my experiments.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Isabelle M. Roquemore

Project Number

J1317

Project Title

Glow with the Flow

Abstract

Objectives/Goals

The objective of this experiment is to determine if narrower bands of the light spectrum excite a luminescent plastic star to different degrees, thus causing the star to glow for different periods of time. Specific bands of the visible light spectrum were selected and representative light bulbs were used as the source. The bands included ultraviolet, blue, green, red orange, yellow and white.

Methods/Materials

Portable work light, glow in the dark stars, stopwatch and artificial light sources: 5W blue LED, 5W yellow LED, 25W Red, 25W green, 57W white and 60W blacklight. Determined the length of time a luminescent "glow-in-the-dark" star glows when exposed to a variety of artificial light sources. Used a dark room to block out ambient light and allow the luminescent star to go dark. Then stimulated the star by turning on an artificial light source and measured the exposure time using a timer for 5 minutes. At the 5 minute mark, the light source was turned off and a timer was used to measure the time required for the star to go dark. Used 7 artificial light sources including a soft white light as a control.

Results

An luminescent star exposed independently to 7 different artificial light sources. The time for the star to go dark after exposure was measured for each light source. A blue 5W LED source provided the most stimulation of a luminescent star taking 37 minutes and 32 seconds to go dark after exposure. A yellow 5W LED light source provided the least stimulation with the star glow only lasting 4 minutes and 54 seconds.

Conclusions/Discussion

After measuring the luminescent star's time to dark after exposure to the 7 artificial light sources, a distinct difference could be seen in the time it took the star to go dark. The original hypothesis was that exposure to 60W ultraviolet(black light) would generate the greatest stimulation of the luminescent star. In fact the ultraviolet light ranked 4th of the 7 light sources tested, ranking just below the soft white light source. It is concluded that specific bands of the light spectrum stimulate an luminescent object to varying and measurable degrees.

Summary Statement

As measured by "time to go dark" after exposure to a variety of artificial light sources, certain bands of the light spectrum were determined to stimulate an luminescent object to varying degrees.

Help Received

I performed the experiment myself. My science teacher and mentor Mrs. Haycraft provided guidance, support, and encouragement.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Joseph Samuel

Project Number
J1318

Project Title
Which Roofing Material Gives the Best Thermal Insulation for a House?

Abstract

Objectives/Goals
The objective of this project is to save energy and help environment by studying different roofing materials and how the different roofing materials properties help it thermally insulate a house.

Methods/Materials
Built a thermal insulation prism with a packing card board box. A model home with 4 walls. Six different roofing materials. A 300 watt incandescent light to heat up the prism and the model home. Acu-Rite thermometer to measure the temperature inside the model home and outside the model home(prism) in 5 minutes interval. Used aluminum covered wood, white painted wood, cornstarch gel covered wood, porcelain, blank painted wood, and asphalt shingles for roofing materials. Took the readings for each roofing material for two iterations, each iteration had 100 minutes for each roof type.

Results
Through the testing, I found how different materials affected the temperature inside the house. Even though the aluminum covered wood was the most effective roofing, but for the real world having the roofs colored white would be the most practical choice to save energy.

Conclusions/Discussion
I could prove the hypothesis that the aluminum covered wood, would reflect the light and helps the roof type thermally insulate. Also, the physical theory of white color reflects more light compared to the black that absorbs the heat.

Summary Statement
At the end of my project I realized if every home is having a white roof the amount of energy that can be saved is enormous and it will also help the environment in a very big way.

Help Received
I designed and built the model and took the hours of reading, testing, and charting all by myself. Mrs. Susan Tu my science teacher from Rancho Del Rey Middle School was my guidance.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Josh A. Van Doren

Project Number
J1319

Project Title
Wild for Wildfire Safety

Abstract

Objectives/Goals
The objective of this study is to test various new materials for the use as a more affective means of protecting our firefighters in case of emergency situations during a wildfire.

Methods/Materials
Tested the fire resistance of lightweight but strong materials as an alternative to the current method of protecting firefighters in an emergency situation. Samples of the current thin fire shelter were tested against samples of 1/2" plywood coated with intumescent paint and as well as samples of a composite panel made of polystyrene sandwiched between two layers of fiberglass and coated with intumescent paint. Multiple samples of each were tested with a propane torch flame while recording the surface temperature on the cool side of the panel for up to one hour or until the flame burned through.

Results
The samples of the current fire shelter tent used by firefighters during an emergency situation burned through within seconds. The samples of the plywood coated with the intumescent paint, although measuring a lower surface temperature during the period of 373.3 degrees Fahrenheit, burned through within an average of just over 17 minutes. The samples of the composite panel, on the other hand, withstood the flame for the full one hour without burn through at an average high temperature of just under 500 degrees Fahrenheit. The composite panel was also 1/3 the weight of the plywood panel at 192.6 grams per square foot.

Conclusions/Discussion
After repeated trials with the three samples, the results were very similar. The current fire shelter did not last more than a few seconds against the flame set at a temperature similar to that found in a wildfire. Though the plywood panel lasted longer, the weight and ultimate failing of the panel did not meet the objectives. The composite panel met and exceeded the one hour trial and, though the surface temperature reached the 500 degree range by the end of each trial, the temperature found at 2" and further from the cool side of the panel was bearable to the human hand. The composite panel being extremely light also makes it an ideal candidate for small transportable protective pods that could be placed at a near distance from the firefighters. The strength of the composite panel could also provide protection from falling debris that is not provided with the current system.

Summary Statement
I have determined that the compostie panel design with an intumescent paint coating could provide an excellent alternative to the current means of protecting our firefighters during an emergency situation while fighting a wildfire.

Help Received
I had the pleasure of meeting and interviewing a firefighter, Captain Jeff Isaacs, of Cal Fire, Department of Forestry and Fire Protection, Southern Region Headquarters who was instumental in directing my experiment.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Hannah Jo Ventura

Project Number
J1320

Project Title
Winter Warmth

Abstract

Objectives/Goals
The objective was to find which fabric provides the best insulation.

Results
Six equal cups of ice, six different kinds of fabric, wet measuring cup for measuring the melted water, clock for timed measuring.

Conclusions/Discussion
measurements were taken every 30min from the ice cups with the different fabrics wrapped around each cup. over a 12 hour period.

Summary Statement
I insulated ice with different fabric and the cup with the most ice was found to be the best "warmest" fabric

Help Received
None, I chose my project, and supplies. My projects advisors held meetings for progress reviews for deadlines.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Anna R. White

Project Number
J1321

Project Title
Stiches that Bind: An Analysis of Seam Strength

Abstract

Objectives/Goals
The objective of this study is to determine whether specialty stiches are necessary for certain fabrics when sewing.

Methods/Materials
Sewing machine, 50 weight thread, 3 fabric types: muslin, jersey knit, and rayon were used to create various seam samples. A purchased hanging scale and home made clamps with grip strips were used to hold fabric in place while testing seam strength.

Results
To begin the analysis, the torn fabric samples were laid out for observation to search for patterns. Two types of failure were noted: fabric and stitch. A fabric failure is when the fabric rips before the stitch breaks, and a stitch failure is when the actual stitching pulls out or breaks. The main observation made during the experiment was that every jersey stitch, regardless of fabric, never had a stich failure.

Conclusions/Discussion
The jersey stitch consistently complimented the jersey knit fabric, proving that is it worth it to use the specialty stiches with certain fabrics. This project is useful for anyone who likes to create their own sewing patterns and can provide guidance to others when thinking about fabric and stitch selections. Further research can be done to account for different variables: thread weight, needle size, additional fabric samples with a similar weave.

Summary Statement
This project will determine whether specialty stiches are necessary for certain fabrics when sewing.

Help Received
I performed this experiment independently. I received support from my teacher, who encouraged me when I shared my idea, my sewing teacher, whom I discussed the different variables with, and my dad, who helped me to build what I had envisioned using to test the seam strength, the clamps.