CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
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Project Number
J1321

Project Title
Rising Force: The Science of Diamagnetism

Abstract

Objectives/Goals

My objective is to measure the diamagnetism of different materials. I hypothesized that pyrolytic graphite would be the most diamagnetic because the material is known for its diamagnetic properties.

Diamagnetic materials are materials that are repelled by both sides of a magnet. The material doesn#t provide any magnetic force by itself, it actually reflects back the magnetic force of the magnet. If the magnet is strong enough, diamagnetism can be used to levitate objects.

Methods/Materials

I compared the diamagnetism of four different materials. The materials were placed under a magnet, their diamagnetism providing an upward force. If the magnet had been light enough, it would have floated. A second "lifter" magnet compensated for gravity. A knob lowered the lifter magnet until levitation was achieved. The more diamagnetic the underlying material was, the more upward lift it applied to the magnet, reducing the need for the lifter magnet, so levitation was achieved with it further away.

Results

My experiment compared the diamagnetism of pyrolytic graphite, paper, glass, and aluminum. I found that pyrolytic graphite was the most diamagnetic, followed by aluminum, glass, and then paper. The experiment was repeated with little variation. Each material's diamagnetism differed from the others' by at least one standard deviation.

Mean Number of Turns to Achieve Levitation (sample size=15)
Pyrolytic graphite: 9 3/40 (std deviation .068)
Paper: 10 1/5 (std deviation .046)
Glass: 10 5/96 (std deviation .028)
Aluminum: 9 4/5 (std deviation .088)

Conclusions/Discussion

My hypothesis was correct; pyrolytic graphite was the most diamagnetic.

Our world is full of friction, causing heat and wasting energy. If we can find a way to reduce friction, we can save energy. Diamagnetic materials can be used to reduce, or even eliminate, friction. If one part of a machine is coated with pyrolytic graphite and another part magnetized, then the components will resist touching- no lubricant required, no friction, no wear.

Summary Statement

Friction wastes energy. The diamagnetic materials that I tested can be used to reduce or eliminate friction.

Help Received

Father proofread and corrected spelling and grammar mistakes.