CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Daniel C. Minter

Project Number
J1226

Project Title
Wingardium Leviosa: The Effect of Temperature on Magnetic Repulsion

Abstract

Objectives/Goals
The objective my project was to determine if a change in a magnet's temperature would affect the strength of the magnetic repulsion of two opposing magnets, and if so, to measure those changes. I hypothesized that the strength of the magnetic repulsion would decrease as the magnet's temperature increased, caused by an increase in the random motion of the atoms of the magnets.

Methods/Materials
To test this, two Neodymium-Iron-Boron ring magnets and two ceramic ring magnets were used. Each set of magnets were submerged in a solution of dry ice and 91% isopropyl alcohol. When the magnets reached -20 degrees Celsius, they were removed and placed on the wooden test stand with their magnetic fields opposing each other. An infrared thermometer was then used to check the temperature of the magnets and using a digital height gauge, the magnetic repulsion was measured at five degrees Celsius intervals until the magnets warmed up to room temperature. The two magnets were then placed in the oven until they reached 100 degrees Celsius. They were then placed back on the wooden stand and tested as above until the magnets cooled to room temperature. The above test was repeated four times with both the Neodymium-Iron-Boron magnets and the ceramic magnets.

Results
The neodymium test data showed an average magnetic repulsion of 87.76mm at -20 degrees Celsius decreasing to an average of 62.36mm at 100 degrees Celsius. Also, the ceramic test data showed very similar results with an average magnetic repulsion of 25.73mm at -20 degrees Celsius decreasing to an average of 22.41mm at 100 degrees Celsius.

Conclusions/Discussion
After reviewing the data, it was found that the experiment's results supported the hypothesis. An increase in a magnet's temperature does cause a decrease in the strength of the magnetic repulsion of two opposing magnets.

Summary Statement
The central focus of this project was to determine if a change in a magnet's temperature would affect the strength of the magnetic repulsion of two opposing magnets, and if so, to measure those changes.

Help Received
My father helped with the dry ice and the construction of the test stands.