



CALIFORNIA STATE SCIENCE FAIR 2017 PROJECT SUMMARY

Name(s) Richard K. Korshkov	Project Number S1816
Project Title Quantum Levitation and Diminishing Electrical Resistance in Unconventional Superconductors	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this experiment was to analyze how superconductors can be used to decrease the amount of power loss due to power transmission and to reveal how quantum levitation is achieved within superconductors. The problem with the current power transmission system is that a significant amount of money is being lost due to the inherent resistance of aluminum and copper power lines. Superconductors would eliminate this problem, as long as the critical temperature was high enough to be used in everyday life.</p> <p>Methods/Materials This experiment was conducted using two different types of superconductors, a YBCO block and a niobium wire, both obtained from a commercial source. The YBCO block was used to demonstrate quantum levitation and the niobium wire was used to reveal the decreasing electrical resistance within a superconductor as it is cooled. Neodymium magnets supplied the magnetic fields, to show quantum levitation. Copper and aluminum wire, were used as controls for the electrical resistance test. Liquid nitrogen was used as the coolant for both the electrical resistance and quantum levitation portions of the experiment.</p> <p>Results As the superconductor increased in temperature, it began to lose its superconductivity and lost levitation height. It took approximately 357 seconds for this superconductor to lose all superconductivity and lost a total height of 11 mm. The superconducting wire had an initial resistance of 10.8 Ohms at room temperature and a final resistance of 3 Ohms at the temperature of liquid nitrogen. The electrical resistance data revealed a downward trend of resistance with a decrease in temperature, and a sharp decrease in resistance as it reached the temperature of liquid nitrogen. This revealed that the wire was starting to superconduct, and was beginning to approach its critical temperature. Both controls showed a decreasing resistance with decreasing temperature, however, they did not have the sharp decrease in resistance like what was seen within the superconducting wire.</p> <p>Conclusions/Discussion This experiment proved that the use of superconductors to decrease electrical resistance, is a viable method of making energy transfer more energy and cost efficient, saving billions of dollars. It also revealed the short amount of time that a superconducting state is maintained at room temperature, even with a high temperature superconductor.</p>	
Summary Statement Unconvention superconductors can be used to eliminate the 15% energy loss to dissipation during electrical transmission, saving billions of dollars.	
Help Received Dr. Boaz Almog provided guidance in designing and carrying out the experiment, in addition to providing materials. Adam Lane oversaw the construction of the scientific research/paper.	