



CALIFORNIA STATE SCIENCE FAIR 2009 PROJECT SUMMARY

Name(s) Conner R. Bennett	Project Number J0902
Project Title Lead Solder Replacement: Comparing the Electrical Resistance of Solder Joints and Electrically Conductive Adhesives	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My project is to determine which electrically conductive adhesive bond compares favorably to the electrical resistance (ohms) of solder joints. The most environmentally friendly alternative to tin-lead solder are electrically conductive adhesives. I believe Silver Print II, a silver coating adhesive, will have the lowest average resistance reading at the end of the seven days of testing. The hypothesis is based on research that indicates Silver Print II should have an average resistance less than or equal to 0.1 ohms per centimeter.</p> <p>Methods/Materials This study will compare solder, the control, with three silver-filled adhesives, one carbon-based electrically conductive glue, and three special formulas. A graphite-filled homemade casein glue was one of the special adhesive formulas. Three identical sample test boards were built with eight sets of tinned copper wire secured ½ inch apart. Solder and the seven conductive adhesives filled the ½ inch gap. Multi-meter readings were recorded two times daily, for seven days in order to observe the resistance in ohms.</p> <p>Results The control sample, solder, had the lowest average resistance for the three sample boards at 0.07 ohms after curing for seven days. The silver coating Silver Print II samples produced the lowest average reading of the electrically conductive adhesive samples at 0.08 ohms. At the end of seven days graphite filled Star brite Liquid Electrical Tape had the highest average resistance reading of the samples at 209.81 ohms.</p> <p>Conclusions/Discussion The data does support my hypothesis that the silver coating Silver Print II adhesive will have the lowest average resistance reading at the end of the seven days of testing. The data demonstrates that the sample board design challenged the electrically conductive adhesives ability to bridge a ½ inch gap. The transition from soldering to lead-free adhesives is still in its early stages of development. Adding specific fillers to existing adhesive compounds is the most common approach to develop low electrical resistance adhesives. Further research with electrically conductive adhesives is needed to find an environmentally friendly replacement for tin-lead solders.</p>	
Summary Statement The purpose of my project is to present experimental data comparing seven electrically conductive adhesive bonds electrical resistance (ohms) to that of solder joints using a homemade test board design.	
Help Received My parents drove me to purchase supplies; paid for all materials; lent me tools and the multi-meter; answered questions about grammar and word choice, took pictures, and made sure I thought safety first.	