



# CALIFORNIA STATE SCIENCE FAIR 2004 PROJECT SUMMARY

<b>Name(s)</b> <b>Andrew C. Morgosh</b>	<b>Project Number</b> <b>J1526</b>
<b>Project Title</b> <b>The Effectiveness of Recycled Materials as Thermal Insulation</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective of this experiment was to find which recycled material would be an effective thermal insulator: fiberglass, wood shavings, polystyrene, polyurethane, cellulose, perlite, polyethylene foil, or bubble wrap.</p> <p><b>Methods/Materials</b> I constructed two boxes out of particleboard. I sawed congruent pieces of each insulating material. For each test, I installed one of the insulators in one of the boxes. I placed a 100-watt light bulb in an aluminum reflector lamp in each box. Using a digital thermometer probe, I checked the temperature and turned on each light bulb. I started a stopwatch and heated the box to 30°C above the room temperature. At 30°C above room temperature, I turned off the light bulb and recorded the decreasing temperatures. After the temperature fell 25°C, I recorded the time. I tested each of eight materials 5 times in this same manner, using a second box as a control each time.</p> <p><b>Results</b> The cellulose material averaged more than 83 minutes, and the fiberglass material averaged over 75 minutes to cool 25°C, which was significantly longer than all other test materials. The polyurethane averaged 42 minutes to cool followed by polystyrene and polyethylene foil, which both averaged about 36 minutes to cool. The perlite and wood shavings cooled quickly (25°C in 32 minutes) followed by bubble wrap, which was the least effective insulator, averaging only 25 minutes to cool. The control box averaged 20 minutes to cool.</p> <p><b>Conclusions/Discussion</b> The cellulose material took the longest amount of time to cool, and appeared to be the most effective insulator. But one drawback of cellulose is that it averaged over 27 minutes to heat to 30°C above the room temperature, which was much longer than any of the other test insulators. In the summer, this might be an advantage, but in winter it many mean more would be expended to heat the house. Fiberglass also took significantly longer to cool than the other materials and only averaged about 12 minutes to heat. Fiberglass was the most effective insulator because it heated quickly and also trapped heat to conserve energy. I noticed that materials with foil such as polyethylene and polyurethane were better insulator than similar products without foil, such as bubble wrap and polystyrene. Foil acts as a heat reflector, and perhaps fiberglass, surrounded by polyethylene foil might make the best insulator.</p>	
<b>Summary Statement</b> The objective of this experiment was to discover which recycled material would be the most effective thermal insulator: fiberglass, wood shavings, polystyrene, polyurethane, cellulose, perlite, polyethylene foil, or bubble wrap.	
<b>Help Received</b> My mother and father drove me to purchase the supplies. My grandfather and great-grandfather helped build the box by using the radial arm and table saws.	