



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

Name(s) Maxwell O. Dawson	Project Number J1306
Project Title Insulation Innovation: Putting Phase Change Materials to the Test	
Abstract Objectives/Goals The inspiration to do this project came to me because my mother is always cold, and I wondered if there was a way to amend that. The purpose of this project was to see how PCMs can compare to conventional insulation, and if PCMs could replace the insulation we use every day. A phase change material (PCM) is a material that absorbs and releases large amounts of heat at its melting point. My hypothesis was that a double layer of PCM would insulate more effectively than a single layer. I also hypothesized that a liquid PCM with a low melting temperature around a solid PCM with a higher melting point would not be efficient at insulating an object. Methods/Materials For my experiment, I used three clear plastic boxes of concentric size. I used two sets, but the experiment could be done with one. I used about 0.5 kg of three microencapsulated PCMs with melting temperatures of 6 C, 24 C, and 37 C. I used two digital thermometers with probes, silicone, a drill and 0.635 cm drill bit, and safety goggles. I used a notepad to record results during the experiments. I placed a thermometer probe inside the inner box, through the holes in the tops of the boxes. After filling each box with the appropriate PCM, I filled the inner box with water. I recorded data every five minutes for one hour. Results I recorded a total of 192 readings from 16 different experiments. I performed eight experiments at each ambient temperature. In the -18 C environment, the PCM 37 around the PCM 24 insulated the water most effectively. In the 55 C environment, the double layer of PCM 24 insulated the water most efficiently. Conclusions/Discussion In general, my hypotheses were supported by my results. PCM 37 around PCM 24 resulted in the least temperature change with exposure to -18 C. I also discovered that a double layer of PCM insulated more effectively than a single layer. I believe more tests should be performed to confirm my results. From packaging to clothing to electronics to building materials, PCMs have many applications that have yet to be explored.	
Summary Statement I tested a new material called a PCM and its properties.	
Help Received Dawn Mantz at Microtek Labs donated PCMs; Father supervised; Mother purchased supplies; Science teacher guided me.	