



CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

Name(s) Judy Shon	Project Number S1826
Project Title Study of the Heat Absorbing Abilities of Different Fibers and the Effects of Laundering on Their Flame Retardancy	
Abstract Objectives/Goals The purpose of this experiment was to determine the heat absorbency and flame retardancy of cotton, polyester, nylon, wool, and the flame retardant fiber, nomex. Another purpose was to find out if washing affected the flame retardancy of these fibers. Methods/Materials The fibers used were cotton, polyester, nylon, wool and nomex. For the heat absorbency test, the materials included a heating apparatus consisting of a ring stand, a ring clamp attached to the stand, a Bunsen burner under the clamp, and two pieces of wire all set up inside a fume hood. Also used was a Raytek infrared thermometer. For the TGA wash test, a SDTQ600 Thermogravimetric Analyzer, Mettler Toledo analytical balance, washing machine, drying machine, and laundry detergent were used. The heat absorbency test was completed by placing each fiber above a flame using a heating apparatus, and measuring the temperature every twenty seconds using a Raytek infrared thermometer. A SDTQ600 thermogravimetric analyzer was used to measure the percent weight loss of each fiber while they were being subjected to intense heat. The original flame retardancy of each fiber was determined using this method, and the process was repeated after each fiber went through ten wash cycles. Results It was determined that the nomex was the safest fiber because it had lower heat absorbency temperatures and was not affected during the test while the other fibers caught fire, melted, or formed a layer of char. Also, the nomex had over 40% of material remaining after the TGA and had higher weight percentages at 300oC and 500oC when compared to the other fabrics. The results of the wash test were inconclusive because there was not a large discrepancy between the washed and non-washed fibers. Conclusions/Discussion The nomex was the best fiber to wear for protection against fire. It had lower heat absorbency temperatures compared to the wool and took longer to heat up, which showed that it was safer to wear in an area with high temperatures. Also, the wool was burned during the test, which was shown through the formation of a char layer while the nomex was not affected. The TGA test showed that the nomex had the highest flame retardancy because it had the greatest amount of material left over after the test. The results of the wash test were inconclusive because the differences between the non-washed and washed fibers were so small.	
Summary Statement Measured the heat absorbing abilities of different fibers, including one flame-retardant fiber, and tested to see if laundering affected the flame retardancy of these materials.	
Help Received Used lab equipment at California State University Long Beach under the supervision of Dr. Young Shon	