CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
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Project Number
J0223

Project Title
Does JB-Weld Have a Usable Strength in Space?

Abstract

Objectives/Goals
My objective was to stimulate the research of space glues that could have prevented the heat shield failure on the Space Shuttle Columbia and future spacecraft repairs by making repairs while in space. I first started with simple tests on a smaller scale with a common epoxy glue, JB-Weld, which was purchased at Home Depot. I created several devices that tested JB-Weld in space like conditions for Shear, Tension, Torsion and Compression forces while vacuumed and at temperatures from -17 to 260 degrees C. I was searching for new methods of actually applying these glues while in a space like environment which is a current problem for N.A.S.A.

Methods/Materials
I used springs, wires, Popsicle sticks and 15mm diameter glass tubes to create these testing devices that were then vacuumed and subjected to hot and cold cycles as in space. I also simulated mixing the compounds in a vacuum to see if they would harden and be useable in space by astronauts.

Results
The epoxy, once cured above 10 degrees C, hardened into a useable product for the most part during hot and cold cycles. The hardened product at -17C appeared to not develop a brittleness common to ice at that temperature indicating that its strength may continue to be useful at much lower temperatures possibly approaching those lower temperatures of space. My experiment did not test to those lower temperatures. My tests were successful in all strength categories and only failed 6 out of 10 torsion tests at higher temperatures than that on the moon.

Conclusions/Discussion
JB-Weld may have a useable strength in space. During one of my final tests in a vacuum, I realized a different approach for astronauts to use. Instead of the conventional two part epoxy where each part must be thoroughly mixed with the other, my experiment showed that by the simple touching of one part to the other a hardened epoxy can be created where a chemical reaction is started at the interface of both substances eliminating mixing. This concept actually happened in my experiment with JB-Weld while under a vacuum to some degree. If scientific research could develop products that did not require mixing but only touching then this approach would greatly simplify the application of epoxy for spacecraft repairs.

Summary Statement
I tested an epoxy glue for useable strength for spacecraft repairs while in space by astronauts.

Help Received
Used lab equipment and supervised during vacuuming and glasswork by licenced neon manufacturer