CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
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Project Number
34781

Project Title
Polymer: The Ultimate Barrier to Fire and Smoke

Abstract

Objectives/Goals
The objective of my project is to discover a fire retardant/smoke barrier material that is nonflammable, nontoxic, easy to use, and long lasting using household products. My goal is that this material will help save people from dying of smoke inhalation.

Methods/Materials
For my experiment, I used a real life scenario of a burning hallway with a closed door in the center. First, I built a hallway and 1/10 scale doorway. Then, I deployed 600 grams of various mixtures into the door jambs and door gaps. I exposed one side of the door to 10 minutes of direct fire from a propane torch. In the second experiment, I thoroughly sealed a smoke generator to one end of the hallway. I marked the time of fire and smoke penetration from each experiment. My independent variable was a variety of different mixtures of common household products. My dependent variable was the time of fire resistance and smoke barrier. My controlled variables (constants) included: the type of fire, the smoke generator, the measurement tools (laser digital thermometer and smoke detector), the construction materials, the mass of fire resistant/smoke barrier material, and the duration of time exposed to fire and smoke.

Results
The only mixture that went the full 10 minutes of sealing the doorway from fire and smoke was the polymer. It withstood up to 1100 degrees Fahrenheit of direct flame without any significant degradation. Also, it sealed the doorway from any smoke penetration past the 10 minute time frame.

Conclusions/Discussion
In conclusion, I learned the best substance was a polymer/distilled water mixture. This performed better than the cornstarch, boric acid, talc, and baking soda. I also learned that the polymer was fire resistant without having to add water. The type of polymer used was sodium polyacrylate. I proved my hypothesis that compounds containing water and minerals are the most effective fire retardants.

Summary Statement
A polymer solution is the best life-saving tool in stopping fire and smoke from entering a room.

Help Received
Mother helped with graphs/tables; uncle helped build hallway and use propane torch.