CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Nick R. Ennis

Project Number
S0505

Project Title
Exposure of Super Absorbent Polymers to Time and Natural Elements

Abstract

Objectives/Goals
My objective is to observe the effects of time and weather on the application of crystalline and amorphous Super Absorbent Polymers in domestic fire prevention. Also, I want to study the configuration and conformation of cross-linked polyelectrolytes.

Methods/Materials
To demonstrate how Super Absorbent Polymers can protect household exteriors I constructed small models using common household building materials. In choosing these materials I used stucco as the most common form of household siding in our area, coated with common exterior paint and primer. The most common roofing materials include high definition laminated roofing tiles, and Spanish clay roofing tiles. I applied multiple varying polymer mixtures to the surfaces. After Super Absorbent Polymers membrane formation, I tested their resistance toward direct heat over time, and charted the results.

Results
Due to the drastic temperature changes throughout the winter months of November and December, the membrane formed buy the Super Absorbent Polymers became brittle and began to break down. The burn ring increased over the six-week period, indicating that the polymer mixture was not tolerating the environmental elements. Based on the presented data, the Super Absorbent Polymers mixtures absorbed water as expected, swelled in mass, and transformed to a gel like state. The polymer gel created a protective barrier for the stucco.

Conclusions/Discussion
The barrier was effective in protecting the stucco from heat and fire damage initially, however with exposure to a variety of climate changes, the Super Absorbent Polymers began to break down and lose effectiveness. The semi-permeable membrane began to deteriorate and lose effectiveness as a barrier. The combination of amorphous and crystalline polymers created a protective membrane with properties from both types contributing to the effectiveness of the barrier gel.

Summary Statement
My project studies the effects of time and weather on Super Absorbent Polymers by combining crystalline and amorphous polymers in a fire prevention application.

Help Received
My Father supervised the application of fire, and polymers were provided by BASF International