Name(s)

Hannah Hessler

Project Number

J0614

Project Title

Can Dry D-cell Batteries Oxidize Carbon Monoxide to Save Your Life in a Fire?

Abstract

Objectives

In the United States one person dies from fire every three hours, and of those 80% of all fire related deaths are from smoke inhalation. Carbon monoxide is the element in smoke that kills you by not allowing the oxygen onto the hemoglobin in your blood. Since fire risk has increased due to recent droughts, I set out to find a way to filter carbon monoxide from smoke using a household item, allowing a person more time to escape from a burning building.This project compares a store-bought emergency fire respirator to an alternative method of carbon monoxide filtration using manganese dioxide removed from dry D-cell batteries.

Methods

First, I extracted the manganese dioxide from one dry D-cell battery. I mixed water with the manganese dioxide to create a paste, and then spread it on a dust mask, creating a filter. I compared the magnesium dioxide filter to: 1) a store-bought emergency fire respirator and 2) a dust mask by itself as a constant for the manganese dioxide filter. I tested them using a device I developed to measure the carbon monoxide levels before and after filtration. The device drew smoke from a fire through tubing where the carbon monoxide level was measured. Then, the smoke was filtered and drawn farther into the tubing where it was measured once more for its carbon monoxide levels. This process was repeated seven times for each filter.

Results

My experimental results prove my hypothesis to be incorrect, as the manganese dioxide filter did not filter as much carbon monoxide from the smoke as the emergency fire respirator. It did however filter 82% of the carbon monoxide that the emergency fire respirator filtered.

Conclusions

In conclusion, Saver, the company that manufactures the emergency fire respirator, claims that their device is able to filter the carbon monoxide from smoke for 5 minutes. If my filter was able to filter 82% of the carbon monoxide that the Saver emergency fire respirator was able to filter, in theory it should allow a fire victim to survive carbon monoxide poisoning up to four minutes and six seconds more than with no filter at all.

Summary Statement

To help save fire victims from carbon monoxide poisoning, I attempted to develop a simple, homemade filter using the manganese dioxide found in dry D-cell batteries to oxidize the lethal carbon monoxide in smoke.

Help Received

I used the help of a qualified scientist named Monte Myers, Kern County fireman and HAZMAT Specialist. He assisted me because I used fire, which can be hazardous due to its nature and the carbon monoxide it produces. He also assisted in the handling of manganese dioxide which was removed from