# Testing the Relative Oxidizing Hazard of Organic Wipes

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## INTRODUCTION

Organic wipes have been widely used in radioactive materials laboratories to clean chemicals spills on benchtops and in gloveboxes. When those chemicals are oxidizing chemicals, they can create a disposable hazard due to the potential for oxidation and combustion of organic materials.

In this work, nine organic fabrics were experimentally evaluated for their relative oxidizing hazard, using a modified approach to the Environmental Protection Agency (EPA) SW-846 Method 1040[1]. This set of experiments is a continuation of previous testing presented at the 2017 American Nuclear Society (ANS) Annual meeting[2].

## EXPERIMENTAL

In the EPA SW-846 Method 1040, a 30-g conical pile of an oxidizing chemical mixed with a fuel is heated with an electrically-heated wire (Fig. 1). A non-oxidizer result was obtained when five replicates of a sample and duplicate sample burned at a rate slower than a 3:7 by weight reference oxidizing standard of potassium bromate ($KBrO_3$) to cellulose mixture, or did not burn at all. The oxidizing chemical sorbed onto the organic wipes (Table I) was potassium nitrite ($KNO_2$), which was found to be the fastest-burning oxidizing chemical in previous studies[3].

Fig. 1. The combustion of chamois mixed with 32 wt.% $KNO_2$ solution.

A few modifications to the EPA method were made. The most noticeable of these are:

a) Instead of grinding and sieving, which is prescribed by the method, the fabrics were cut into ~1 sq. inch-pieces.
b) Samples were tested directly without the addition of cellulose, because the organic polymeric sorbent provides a source of fuel for the reaction.
c) Oxidizing chemical samples were dried to a constant mass at 65 ± 10 °C rather than for 12 hours at 65 ± 5 °C. They were kept in the oven until they were burn tested (Fig.2).

Fig. 2. Several samples of different organic wipes mixed with different concentrations of $KNO_2$ solutions awaiting for testing in oven.

## RESULTS

In Table I are given the main results on the nine wipes tested in this study.

Two samples, Hazmat Sorbent SM Pads and Kimtech Pure W4 Wipers, produced non-oxidizer results even when mixed with a near-saturated (75 wt. %) $KNO_2$ solution to their sorption capacity. On the other hand, Cheesecloth Wipers, Quik Solid Pads and PIG BLUE Absorbent Mat were tested as oxidizers using a 5 wt. % $KNO_2$ solution.

Complete results can be found in a Los Alamos National Laboratory (LANL) report[4], and will be discussed during the presentation.

## ACKNOWLEDGEMENTS

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## REFERENCES

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Table I. List of sorbents evaluated in this study, their primary chemical composition, the maximum $KNO_2$ concentration in dry sample (in weight percent – wt. %) for the corresponding result.

| Sorbents | Primary Chemical Composition | Maximum $KNO_2$ concentration in dry sample (wt. %) | Overall Results |
|---|---|---|---|
| Hazmat Sorbent SM Pads, Premium Wipers | Polypropylene | 90 | Incomplete burns → non-oxidizer |
| Kimtech Pure W4 Wipers | Polypropylene | 85 | Incomplete burns → non-oxidizer |
| Polybenzimidazole (PBI) Staple Fiber | Sulfonated polybenzimidazole | 40 | Incomplete burns → non-oxidizer |
| Tanner's Select Chamois | Polypeptides (mostly collagen) | 32 | Incomplete burns → non-oxidizer |
| Wool Felt | Polypeptides (mostly keratin) | 30 | Incomplete burns → non-oxidizer |
| Microfiber Cleaning Cloth (Suede) | 80% Polyester<br>20% Nylon (polyamide) | 17 | Non-oxidizer |
| Cheesecloth Wipers | Cellulose | 22 | 65 % average rate relative to standard → Oxidizer |
| Quik Solid Pads | 70-100% Polyester<br>10-30% Sodium polyacrylate | 49 | 55 % average rate relative to standard → Oxidizer |
| PIG BLUE Absorbent Mat | 60-70% Cellullose<br>15-25% Polypropylene<br>10-15% Polyethylene<br>10-15% Fire retardant<br>10-15% Polyester | 33 | 93 % average rate relative to standard → Oxidizer |