

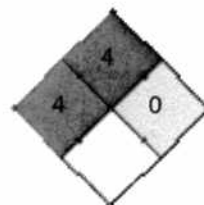
Safe Decomposition of CaS_x & HCL Solutions

A Detergent Suicide Clean-up Technique

Case Review
By
Bill Mayfield, RN
HazMat Specialist

Background

- H_2S
 - UN ID: 1053
 - CAS: 7783-06-4
- Flammable Range: 4%-44%
- Colorless Gas with Strong Odor of Rotten Eggs
- NIOSH REL: 10 ppm (15 mg/m³) [10 min.]
- IDLH: 100 ppm
- LC₅₀ : 444 ppm
- RGasD: 1.19
- Significant Inhalation Hazard
 - Complex Asphyxiant



Normal Uses/Occurrences

- Thioorganic compounds
- Alkali metal sulfides
- Analytical chemistry
- Precursor to metal sulfides
- Oil & Gas Production
- Volcanic and Hot Springs emission
- Organic Decomposition (Sewer Gas)



With Suicidal Intent

Acid Sources	Sulfur Sources
Lysox® Ready to Use Disinfectant (4–8 percent citric and hydroxyacetic acid)	Artist oil paints (0–15 percent zinc sulfide)
Lysox® Toilet Bowl Cleaner (9.5 percent HCl)	Dandruff shampoos (1.0 percent selenium sulfide)
Sno Bok® Toilet Cleaner (15 percent HCl)	Pesticides (5–30 percent calcium polysulfides)
The Works® Toilet Bowl Cleaner (15–25 percent HCl)	Spackling paste (1–2 percent zinc sulfide)
Blu-Lite® Germicidal Acid Bowl Cleaner (20.5 percent phosphoric acid)	Some latex paints (6.6 percent zinc sulfide)
Kaboom® Shower, Tub, and Tile Cleaner (5–7 percent urea-monohydrochloric acid)	Garden fungicides (5–90 percent sulfur)
Tile, stone cleaners (1–30 percent HCl)	
	UNCLASSIFIED//FOR OFFICIAL USE ONLY



El Paso County, CO

November 17, 2009

- 35 yo male found lying in the back seat of his car by a neighbor. 911 called.
- Signs in Window
- Estimated Exposure Time: 2 hours.
- Emergency Response
 - El Paso Co Sheriff's Deputies
 - Cimarron Hills Fire Department
 - AMR
 - El Paso Co Sheriff's HazMat Team



- Chemical bottles noted inside car.
- Visible off-gassing
- Command Assumed
 - EPSO Fire Marshal
- Rescue
 - Resuscitation
- Investigation



Precursors



JoeBonsai Lime Sulfur
(Calcium polysulfide)



Lysol Toilet Bowl Cleaner
(Hydrogen Chloride)

Incident Stabilization

- Full HazMat Team arrived.
 - Multiple entries – Level B
 - Recon, monitoring & detection
 - Evidence Collection
 - Chemical Identification
 - Containment/Clean-up
 - 5-gal. bucket, opened chemicals, other contaminated materials overpacked.
 - Equipment and exposed turn-out gear decontaminated.
 - Turn-outs bagged and extracted later.

Clean-up & Disposal

December 17, 2009

- Multiple attempts to contract disposal failed.
 - No contractor wanted to touch this stuff!
- Consulted Ken Niswonger, Colorado Health HazMat Chemist
 - Analysis of composition/decomposition reactions.
- Theoretical decomposition reaction identified.
 - Combination of neutralization & oxidation.
 - Bill, someone needs to test it.....



Let's Make A Cake!!

December 18, 2009

- Control Zone & Safety
 - Isolated Area with Limited Down-wind Exposures & Blast Protection.
 - Emergency Decon, Air Monitoring.
 - Fire Suppression & Medical Standby.



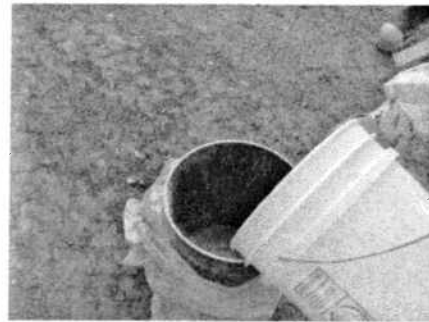
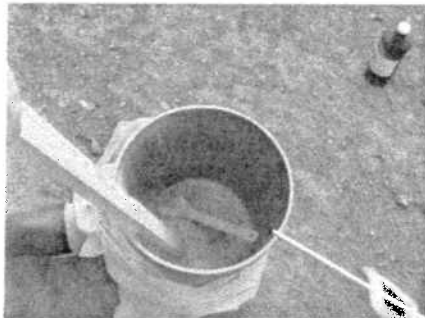
Set-up & Ingredients

- Original Mixture
 - Lime Sulfur & Toilet Bowl Cleaner
- Ordinary Portland Cement – 40 lbs
- 3% Hydrogen Peroxide – 1 Quart
- 1X2 Wooden Stir Stick
- Plastic Dog Food Scoop



Step 1 – Reconstitute

- Lime Sulfur & Acid
 - $\text{CaS}_x + \text{HCl} \rightarrow \text{CaCl} + \text{H}_2\text{S} + \text{S}^{2-}$
- **Immediate H_2S /LEL Detection!**



Step 2 – Add Cement

1 Scoop, slowly, while stirring

- $\text{CaS}_x + 2\text{HCL} + \text{CaCO}_3 \rightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O} + \text{S}^{-2}$



Step 3 – Add Peroxide

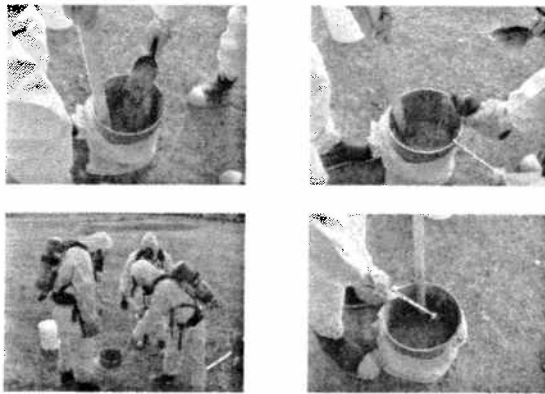
½-1 Pint, slowly, while stirring

- $\text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O} + \text{S}^{-2} + \text{H}_2\text{O}_2 \rightarrow$
 $\text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O} + \text{S}_0$



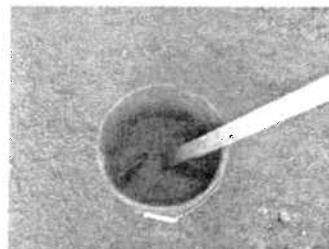
Step 4 – Repeat Cycle

- Repeat steps 2 & 3, monitoring pH and gas emissions, until no additional reaction.



Step 5 – Cement Solidification

- Place Mixture in a Secure Location
 - To Solidify.
 - Well Ventilated Area.
 - Periodically Monitor for Gases.
- May dispose of in normal waste stream.
 - After hardened.



Terminate the Operation

- Decon, Medical Monitoring, Hot Wash



Thanks to Ken Niswonger

“Saving Lives Through Outstanding Chemistry”

32 Years of Service to Colorado

Retired, March 26, 2010



Questions?

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