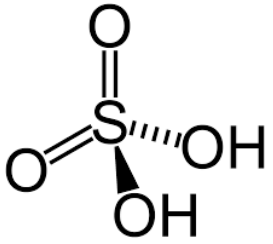
Sulphuric Acid Safety



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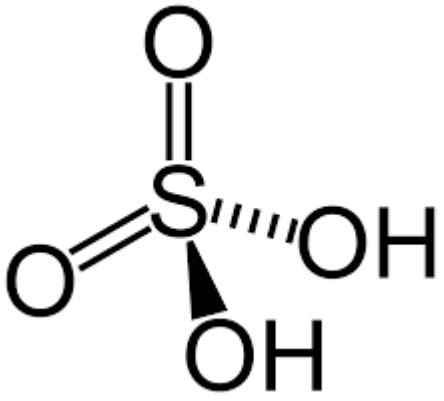
Properties of Concentrated H_2SO_4

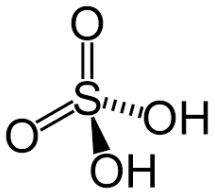
- Colorless to slightly yellow viscous liquid
- Oxidizing (no rubber gloves)
- Exothermic dissolution in water
- Acidic when dissolved in water (pH decreases)
- When diluted, reacts with ferrous metals and generates Hydrogen gas
- Dehydrating (Hygroscopic)
- Reacts with $FeCl_3$ -> HCl/Cl_2
- Reacts violently with NaOH
- Carcinogenic in mist form
- Very Dense: 1.8 Kg/Liter



Uses of Sulfuric Acid

- Sulfuric acid is the world's most produced industrial chemical by volume. The main use is in the production of phosphate fertilizers. It is used to manufacture explosives, other acids, pharmaceuticals, chemicals, dyes, glue, wood preservatives, lowering pH, and as an acid in automobile batteries.

Corrosion Rates



- The rate of corrosion of carbon steel in 93% SULPHURIC acid at ambient T ranges from 0,005 to 0,020 inches per year
- At this corrosion rate, an allowance of 0,125 inches (3 mm) will last from 6 to 25 years

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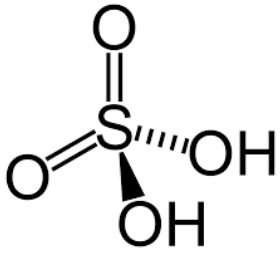
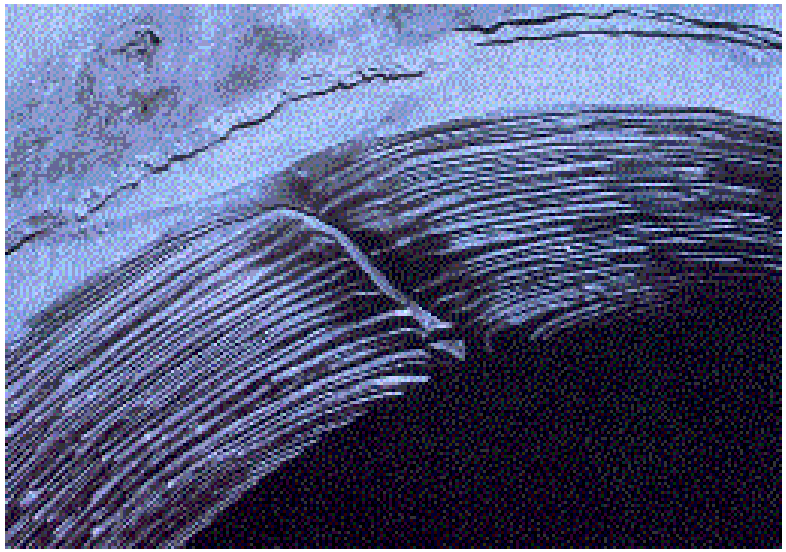
Design Standards for H_2SO_4 Tanks

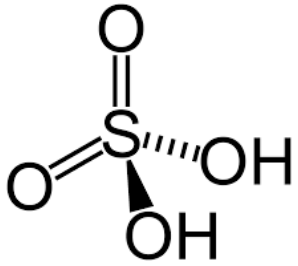
- EN 10204 - Metallic products Types of inspection documents
- API 510 - Pressure Vessel Inspector Program
- API 620 - Design and Construction of Large, Welded, Low-pressure Storage Tanks
- API 650 – Welded Tanks for Oil Storage
- NACE Standard – SP0294-2006 (formerly RP0294-94): Design, Fabrication, and Inspection of Tanks for the Storage of Concentrated Sulfuric Acid and Oleum at Ambient Temperatures



Hydrogen Grooving

- When moisture gets into the concentrated H_2SO_4 tank, hydrogen can be generated at the diluted spots and “Hydrogen Grooving” can occur. See photo below.





First Aid

- In case of contact with skin, first **blot out** the chemical DO NOT use water because the reaction with water is exothermic

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Skin Damage Mechanism

- Low pH denatures proteins in skin (chemical burns)
- Exothermic reaction with water in skin causes thermal burns
- Hygroscopic nature of acid dewaters your skin hence skin turns “Black” like Carbon
- Oxidizing property of Acid damages tissue and causes chemical burns

Sulphuric Acid Chemical Burns

Neutralization of Spills

Step #2 – Determine Amount of Neutralizer Required

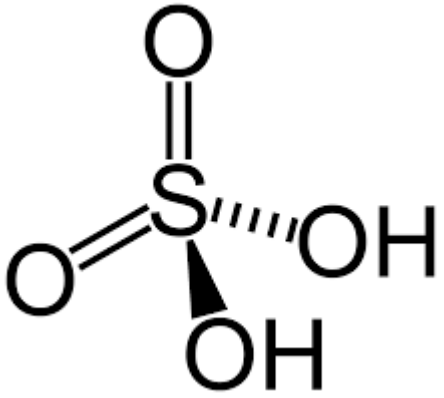
Weight of Acid Spilled X Number in Chart (below)
= Pounds of Neutralizer Required

	Quicklime	Hydrated Lime	Crushed Limestone	Soda Ash
	CaO	Ca(OH)2	CaCO3	Na2CO3
lbs of neutralizer required to neutralize 1 lb of 93% Sulfuric Acid	**0.54**	**0.72**	**0.97**	**1.01**

Storage Tank Inspection

- External NDT thickness monitoring:
  - Every 2 years
  - Develop a corrosion rate curve

- Internal Inspection
  - Every 5 years
  - Confined Space entry



Bulk Unloading

- Secure truck
- Secure area
- Full chemical safety gear for operator and tanker truck driver
- Follow SOP procedure

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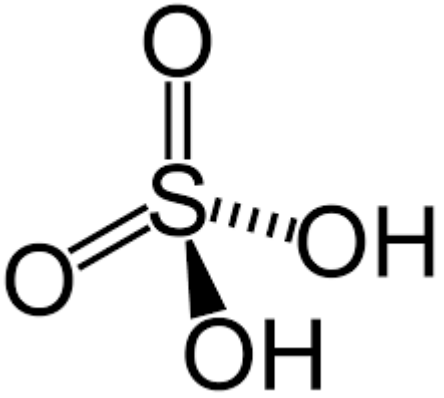
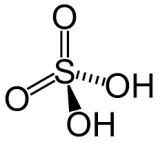


Quiz Question

- Why is the sulphuric acid tank made from Carbon Steel if Sulphuric acid reacts with Iron?

- Answer: H_2SO_4 reacts with Fe to form Ferric Sulphate which acts as a protective layer and prevents further reaction between H2SO4 and Fe.

References



- Norfalco Safety Training
- http://www.sulphuric-acid.com/
- COSHH
- Public Health England
- HPA (UK Health Protection Agency)

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