Sulphuric Acid Safety

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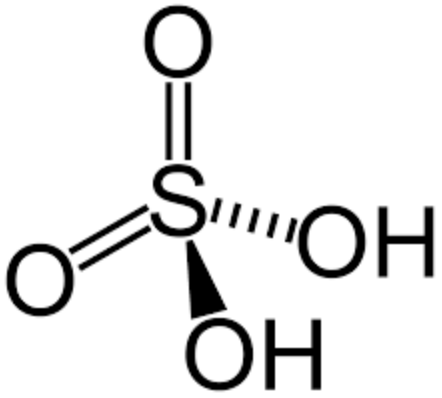
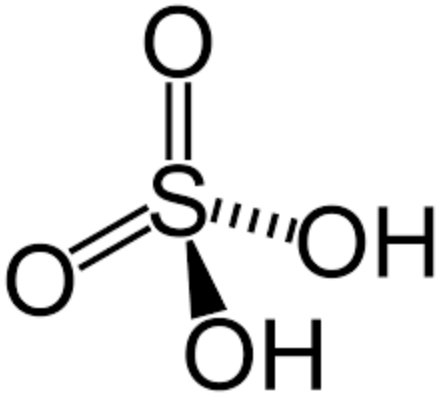


Properties of Concentrated H_2SO_4

- 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



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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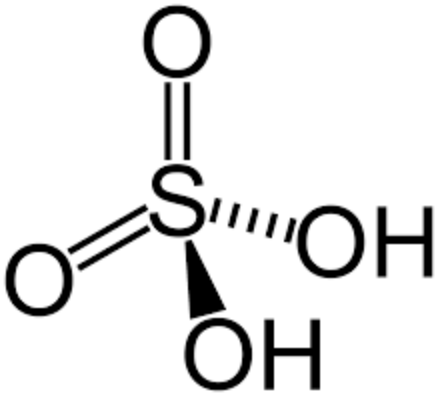
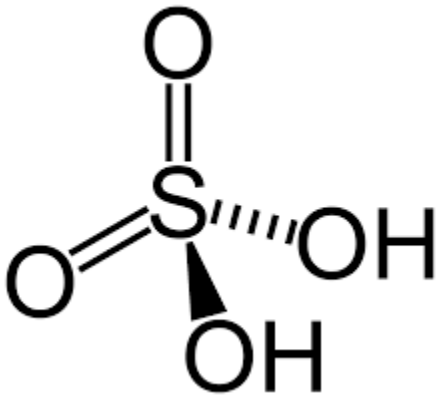


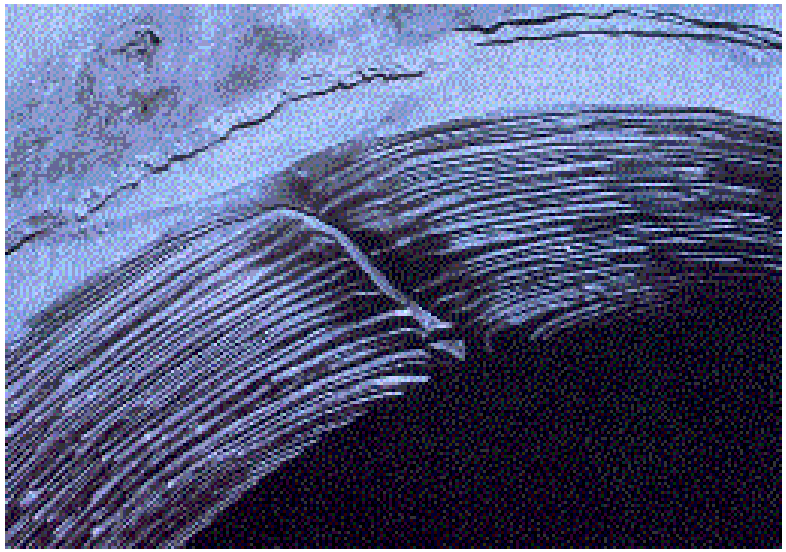
Design Standards for H_2SO_4 Tanks

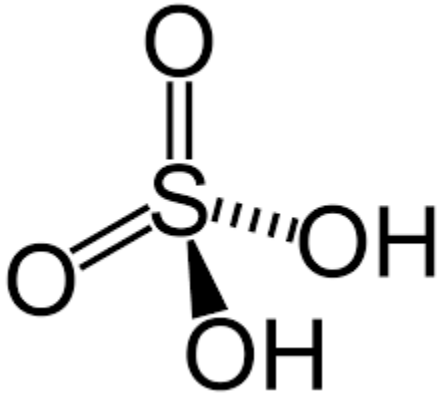
- EN 10204 - Metallic products Types of inspection documents
- API 510 - Pressure Vessel Inspector Program
- API 620 - Design and Construction of Large, Welded, Low-pressure Storage Tanks
- API 650 – Welded Tanks for Oil Storage
- NACE Standard – SP0294-2006 (formerly RP0294-94): Design, Fabrication,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

Neutralization of Spills

Step #2 – Determine Amount of Neutralizer Required

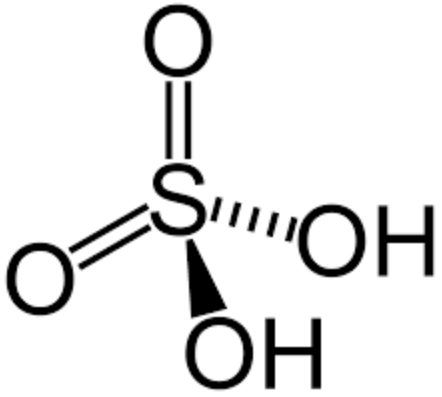
Weight of Acid Spilled X Number in Chart (below)
= Pounds of Neutralizer Required

	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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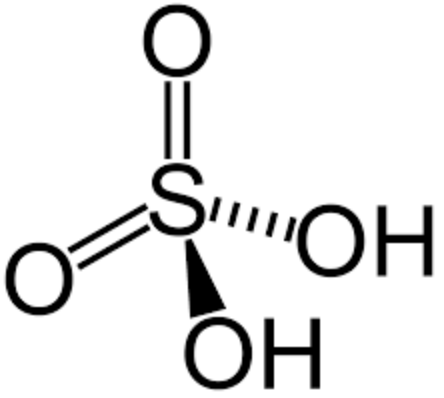

Quiz Question

- 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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