Which Household Acids Corrode Metal the Fastest?

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Question

Which household acidic solution causes the fastest metal corrosion?

Hypothesis

Different acids react with metal at different rates due to their chemical composition and strength, which can influence how quickly corrosion occurs. Based off of this information, vinegar will make the nail corrode the fastest.

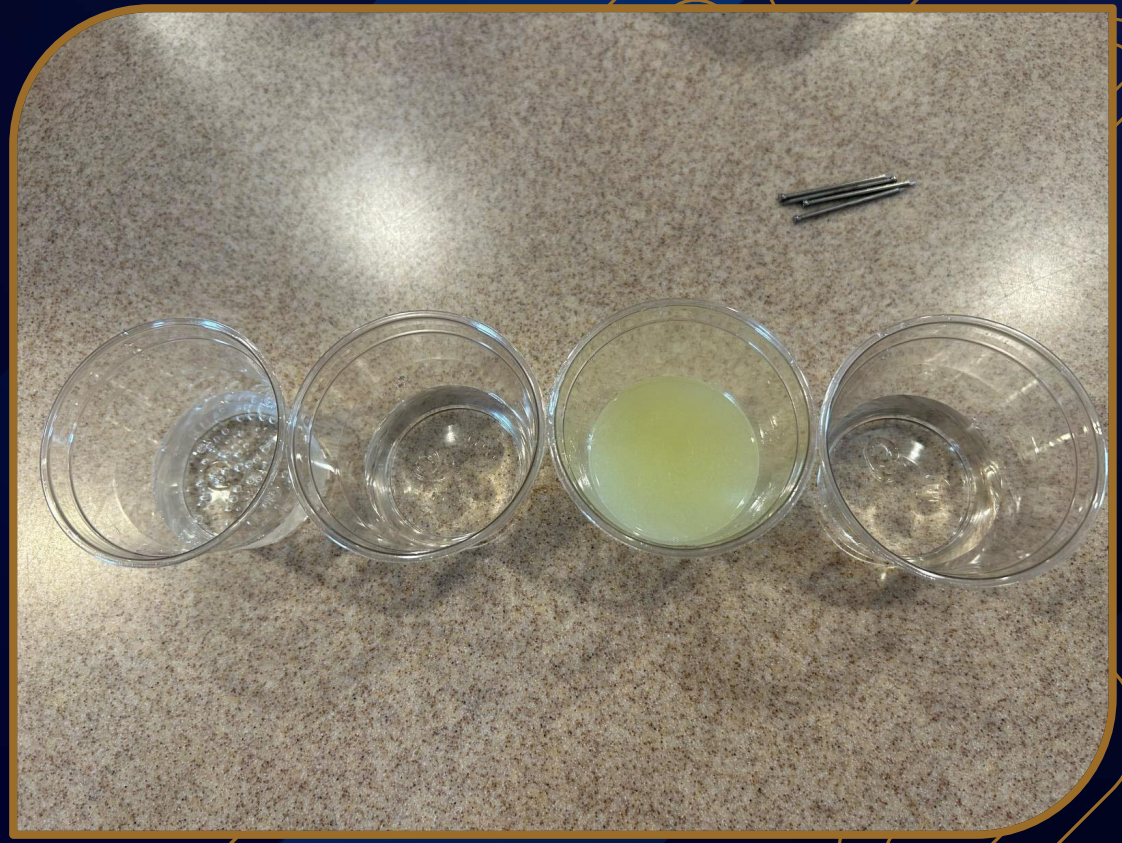
pH Factor

Lower pH => Stronger Acid => Faster corrosion

- ➔ Acids have low pH levels
- ➔ Low pH means higher hydrogen ion concentration
- ➔ The ions attack metal surfaces
- ➔ Speeds up corrosion

The Experiment

- Using four liquids (Sprite, Vinegar, Lemon Juice, Water), I dropped an iron nail in them and observed results for seven days.



Making Observations

	Sprite	Vinegar	Lemon Juice	Water
Day - 1	Liquid: Clear Nail: No rust	Liquid: Clear Nail: No rust	Liquid: Pale Nail: No rust	Liquid: Clear Nail: No rust
Day - 2	Liquid: Light yellow Nail: No rust	Liquid: Clear Nail: Small bubbles	Liquid: Pale Nail: No rust	Liquid: Slight orange tint Nail: Very little rust
Day - 3	Liquid: Greenish yellow Nail: No rust	Liquid: Dull tip Nail: Shows white deposit	Liquid: Muddy Nail: Little rust	Liquid: Orange brown Nail: Top shows rusty
Day - 4	Liquid: Greenish pale Nail: No rust	Liquid: Less clear Nail: Shows white deposit	Liquid: Muddy Nail: Little rust	Liquid: Orange brown Nail: Top shows rusty
Day - 5	Liquid: Olive colored Nail: No rust	Liquid: Less clear Nail: Half covered with white deposit	Liquid: Muddy Nail: More rusty	Liquid: Orange brown Nail: Shows orange substance
Day - 6	Liquid: Darker olive Nail: No rust	Liquid: Less clear Nail: Covered with white deposit	Liquid: Light brown Nail: Rusty	Liquid: darker orange brown Nail: Orange substance on tip, no dulling
Day - 7	Liquid: Brownish Nail: Rust	Liquid: Muddy brown Nail: Completely covered with white deposit	Liquid: Pale/ Brown Nail: Rusty	Liquid: darker orange brown Nail: Rust

Result

VINEGAR

The iron nail left in the vinegar showed the most corrosion over the test period.

Why Vinegar?

- Lime juice (pH 2.0 – 2.35) has lower pH than vinegar (pH 2.4 – 3.4)
- Vinegar contains acetic acid (CH_3COOH) that acts as a strong electrolyte and electron acceptor
- This causes faster, more aggressive oxidation of metals

Thanks!

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