EFFECTS OF ACIDIC WATER ON THE EROSION OF VARIOUS ROCK TYPES

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To what extent does acidic water affect the erosion of different rock types (Sandstone, Granite, Calcite, Quartz)?

Hypothesis: Acidic water does affect the erosion of various rock types

Null Hypothesis: Acidic water has little to no effect on the erosion of various rock types
Acidic water is simply H2O with a pH that is lower than pure H2O’s pH of 7.

Acidic rain affects natural aquatic environments/ecosystems:
- Rivers
- Streams
- Lakes
- Seas
Acidic H2O does not just taint water systems, but the objects around those bodies of water

THINK ROCKS!

Acidic water could hasten the erosion process for basic rocks that we see everyday in Pennsylvania, like sandstone

If we could test the erosion effects of acidic water on various rock types, then we could infer which rocks are harder hit by waters with lower pH’s

BACKGROUND CONTINUED
The researcher obtained four rocks of different types – one piece of quartz (22.5 grams), one piece of calcite (39.0 grams), a slab of granite (2258.9 grams), and one sandstone rock (4740.0 grams).

The experimenter then hammered the granite and sandstone rock into three pieces of near equal size to use for three trials. The calcite and quartz were implemented in trials 2 and 3 as a continuation of trial 1, since they were so small in mass.

The first trial began, and the rocks were placed into a glass container filled with 400 mL of water and 50 mL of red wine vinegar.

Notes were taken every three days, observing the change in water levels and content, rock structure, features, and masses.

Steps 3-5 were repeated for trials 2 and 3.
In this trial, I had four rocks – one piece of quartz (22.5 grams), one piece of calcite (39.0 grams), a granite rock (2258.9 grams), and one-third of a sandstone rock (1714.6 grams).

I poured 400 mL of water and 50 mL of red wine vinegar into a glass container, and then inserted the four rock pieces into the basin.

By the end of the four week period, the rocks had frayed in color.

Even the quartz, which at the onset had been whiter than the calcite, was almost indistinguishable from the dull-colored calcite.

White residue was collected around the glass container, and the water contained a gray murkiness.

The sandstone specifically developed tiny hole-like crevices on the surface that was covered in acidic water.

Neither the quartz nor the granite diminished in weight

Sandstone declined to 1664.7 grams, a drop of .97%

Calcite dropped to 383.3 grams, a decline of 1.74%.
By the end of the four week period, the rocks had frayed in color.

Even the quartz, which at the onset had been whiter than the calcite, was almost indistinguishable from the dull-colored calcite.

White residue was collected around the blue glass container, and the water contained a gray murkiness.

The sandstone specifically developed tiny hole-like crevices on the surface that was covered in acidic water.

Neither the quartz nor the granite diminished in weight

Sandstone declined to 1664.7 grams, a drop of .97%
Calcite dropped to 38.3 grams, a decline of 1.74%.
In the second trial, I used the same piece of quartz, calcite, and granite (granite doesn’t break too easily), and a different piece of sandstone (2150.0 grams).

I poured 400 mL of water and 50 mL of red wine vinegar into the cleaned blue glass container, and then inserted the four rock pieces into the basin.

On Day Two, a can of Folger’s coffee blend spilled into the basin, effectively ending trial two, and any hopes of finding conclusive evidence for erosion from acidic water.
In the third and final trial, I used the same piece of quartz, calcite, and granite, and a different fragment of sandstone (916.26 grams).

I poured 400 mL of water and 50 mL of red wine vinegar into the cleaned blue glass container, and then inserted the four rock pieces into the basin.

- Sandstone dipped to 902.65 grams, a 1.5% drop
  - Developed a white powder around its water-covered base
  - Large white blotches on its surface
- Calcite dropped to 38.2 grams, a 0.3% decline
- Calcite and Quartz show little signs of change
- Granite also developed white spots around its bottom

**TRIAL THREE (JAN. 6TH – JAN. 21ST)**
TRIAL STATS (PERCENTAGE DROPS)
Acidic water affects the erosion of various rock types

Some rocks are more affected than others

Sandstone and Quartz experienced more changes than Granite and Calcite

Sandstone and Quartz lost weight and color

Granite and Calcite remained constant in mass and hue

Acidic water is an outside factor that can tremendously impact gradual or dramatic changes

CONCLUSION
POSSIBLE DRAWBACKS

- Low number of trials (2 full, 1 ended early)
- No true control variable
- How relatable is red wine vinegar to acidic water found in the environment?
With this knowledge, scientists should look into the geochemical components of rocks (why sandstone varied in stability compared to granite)

Is there any way that we can tame acidic water in our natural environment?

If it cannot be contained, then do we expect to see geostructural changes, and how soon?
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