HydroLock - Sulfuric Acid Experiment

Purpose

To evaluate the effect of HydroLock at 1%, 3% and 6% in a water solution, when applied to sulfuric acid.

Test Amounts

40 ml of sulfuric acid, plus 120 ml of water and a predetermined amount of HydroLock were added to a beaker.
A second 120 ml of water and HydroLock were added to see the effect.

Laboratory Equipment

Glass beaker for the acid
Sheet of aluminum for reactivity test
Glass beaker and sugar for reactivity test
Litmus paper
pH meter

Personal Protective Equipment

Acid apron
Face shield
Rubber gloves

Test 1

40 ml of sulfuric acid was added to the glass beaker. This was poured on the aluminum plate with a violent reaction. The sulfuric acid was then poured into a beaker containing two teaspoons (8 ml) of sugar. A violent reaction occurred, blackening the sugar. 120 ml of water was added to the 40 ml of sulfuric acid with vapor being released from the mixture.

Test 2

40 ml of sulfuric acid was added to the glass beaker and a thermometer was placed into the beaker. The temperature was recorded at 68°F. 120 ml of water with 1% HydroLock was added to the 40 ml of sulfuric acid. The temperature increased to 105°F in four seconds. Another 120 ml of water and 1% HydroLock was added to the solution and the temperature instantly dropped to 90°F. The resulting mixture was again applied to the aluminum plate and poured into the sugar, as in Test 1, with no reaction.

Test 3

40 ml of sulfuric acid was added to the glass beaker and a thermometer was placed into the beaker. The temperature was recorded at 68°F. 120 ml of water with 3% HydroLock was added to the 40 ml of sulfuric acid. The temperature increased to 90°F in one second. The resulting mixture was applied to the aluminum and poured into the sugar, as in Test 1, with no reaction.

Another 120 ml of water and 3% HydroLock was added to the solution and the temperature instantly dropped to 70°F. The resulting mixture was again applied to the aluminum plate and poured into the sugar, as in Test 1, with no reaction.

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HydroLock - Sulfuric Acid Experiment (continued)

Test 3

40 ml of sulfuric acid was added to the glass beaker and a thermometer was placed into the beaker. The temperature was recorded at 68°F. 120 ml of water with 6% HydroLock was added to the 40 ml of sulfuric acid. The temperature increased to 98°F in two seconds. The resulting mixture was applied to the aluminum and poured into the sugar, as in Test 1, with no reaction.

Another 120 ml of water and 6% HydroLock was added to the solution and the temperature instantly dropped to 80°F. The resulting mixture was again applied to the aluminum plate and poured into the sugar, as in Test 1, with no reaction.

Conclusion

A chemical engineer from Calgary was hired to evaluate the results. In his analysis, the HydroLock rendered the sulfuric acid noncorrosive by encapsulating the sulfur molecule, similar to the way HydroLock encapsulates hydrocarbons. This effectively prevents the sulfuric acid from being reactive. At the same time, the cooling properties of HydroLock are apparent, having a positive effect on the reactivity.

The chemical engineer was very impressed at HydroLock's ability to make sulfuric acid noncorrosive. It should be noted, the pH of the acid changed very little. The original pH was .3 and it increased to .6. The engineer was surprised to see a low pH with the acid being nonreactive. It was noted that sodium bicarb could be added to bring the pH to neutral (7).

Ultimately, it was determined HydroLock was very effective in "shutting down the acid" rendering it noncorrosive and nonreactive. A 3% solution of HydroLock and water seemed to be the optimum mixture since 1% did not work as well and 6% provided no additional advantages. At 3x ratio, the heat was stopped and corrosivity prevented. Adding another batch (6x ratio) reduced the heat to its original temperature (within two degrees). This solution could be applied to sulfuric acid storage vessels and reduce the residual acid to a harmless solution.

Based on these promising results, further testing was planned on hydrochloric acid and caustics used in petrochemical plants.

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