



CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

Name(s) Alexis H. Kim	Project Number 36796
Project Title The Effect of Ascorbic Acid and Phosphate on Copper Corrosion	
Abstract Objectives/Goals A lower scale faster model of copper pitting was created with a copper pipe loop to measure whether or not ascorbic acid and phosphate inhibited copper corrosion. Methods/Materials It was assumed that copper corrosion occurred when copper was found in the test water after trials had been performed with a recirculating copper loop system. The copper was detected and measured using reagents. Ascorbic acid and sodium phosphate NaH_2PO_4 were chosen to be tested because ascorbic acid is used to neutralize chloramine (one of the suspected causes of copper pitting in households) in hospitals and phosphate creates a natural coating in a pipe. Results Distilled water and tap water were used as controls, and the water conditions tested were tap water with ascorbic acid, tap water with phosphate, and ascorbic acid with phosphate. The copper loop system continuously produced consistent results. It was found that tap water with phosphate had the lowest amount of copper (compared the averages after 6 trials of each condition) meaning that it had the best results. On the other hand, tap water with ascorbic acid released the most copper from the pipe, which was unexpected. Overall, sodium phosphate decreased copper corrosion significantly for each condition. Conclusions/Discussion The experiment yielded very consistent results, and it was concluded that phosphate was a reliable inhibitor of copper corrosion. Throughout Southern California, and other places across the U.S., homeowners burdened with pinhole leaks in their copper plumbing systems. Any research on this topic would be significant in fixing or even preventing this expensive and water-wasting problem.	
Summary Statement By successfully building an experiment that was a faster model of copper corrosion, I was able to measure and observe the effects of ascorbic acid and phosphate on copper corrosion, and conclude that phosphate inhibits corrosion the best.	
Help Received Dr. James Li, Dr. Todd Haney, and Dr. Chuck Cao were helpful mentors. Dr. Todd Haney helped get me a water pump and Dr. David Fruman gave me sodium phosphate to use in my project.	