



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Athena A. Wigo	Project Number J0627
Project Title A Quantative Analysis on the Effect of Additives on Various Crystal Structures, Lattices, and Physical Properties	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this study is to determine the effect of additives on crystal growth.</p> <p>Methods/Materials Glass jars, wooden sticks, clips, filtered water, sugar, salt, measuring tape, chlorophyll, beet juice, clean cloth. I made solutions for salt, sugar, and borax crystals. I added chlorophyll to one solution and beet juice to one solution. The third solution in each group was left as a control. I waited the same amount of time for each group, and then measured growth.</p> <p>Results Various crystal types were grown, and additives (chlorophyll, beet juice) were added to some of the solutions, the rest were left as the control group. I measured the crystal growth after controlled growth times. The beet juice solutions, then chlorophyll, then the control group, had the most crystal growth.</p> <p>Conclusions/Discussion My additives had a positive effect on crystal growth. It is important to know that additives can change the growth rate and structure of crystals. This knowledge can be applied to other materials as well and used in various real world applications. For example additives may be used to hinder scale and crystal growth on machinery. An example a material of common usage, which we could test additives on is metals. Additives may improve machinity, heat resistance, etc. of different metals.</p>	
Summary Statement I showed that additives, in this case, chlorophyll and beet juice, have a positive effect on the growth of crystals.	
Help Received My Science teacher reviewed my data and explained the process of calculating error bars.	