



**CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY**

Name(s) Nicholas A. Hammons	Project Number J0612
Project Title Kitchen Synthesized Magnetite Nanocrystals for Removing Arsenic from Water	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals In this project, I synthesized magnetite nanocrystals in my home kitchen using everyday household supplies.</p> <p>Methods/Materials The ingredients for the synthesis of nanocrystals include oil, vinegar, soap, rust, thermometer, grater, spoons, funnel, pan, and stove. My experiments are broken up into three main areas: The soap synthesizing process, fatty acid mixture from soap process, and magnetite nanocrystals synthesis. Below, the reactions of the three experiments are listed. Vegetable Oil+Drain Opener(NaOH)=Soap; Vinegar+Soap=Fatty Acid Mixture(Oleic Acid) Rust+Fatty Acid Mixture (Oleic Acid)=Magnetite (Fe₃O₄)Nanocrystals</p> <p>Results Black slurry was created for each case of fatty acid mixture and rust except the second run with 20% acidity vinegar. The overcooked 20% vinegar only showed rust in the pan. The other three runs had various amounts of nanocrystals formed. The third run seemed to have the largest amount of crystals. With the third run, I was able to measure the temperature of the reaction with an optical thermometer throughout the run.</p> <p>Conclusions/Discussion I show that not only can you synthesize nanomaterials in the home using everyday household supplies and using home kitchen facilities but also provide feedback on the viability for using this process as an open source technology. To support arsenic removal on the scale of a small town, the production of nanocrystals could easily grow beyond what normal people could realistically produce. While the suggested cost reduction of materials from lab grade to everyday grade is more than 100x less, the industrialization of the process will increase the cost for utilization. An alternative to industrialization of the kitchen process is to setup a "blood bank" for nanocrystals where people from the local town would grow and donate nanocrystals to a government-owned facility. This social network would make use of the open source technology keeping the cost low with continual improvements in the kitchen synthesis of magnetite nanocrystals.</p>	
Summary Statement I grew magnetite nanocrystals for arsenic removal from water in my kitchen using open source nanotechnology.	
Help Received Mrs. Allen helped with the application process and abstract; my parents helped with the hazardous parts of my project.	