



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

<b>Name(s)</b> <b>LeAnn Tai</b>	<b>Project Number</b> <b>J1128</b>
<b>Project Title</b> <b>Efficient Removal of Soil Contaminants Using Biodegradable Adsorbents</b>	
<b>Abstract</b> <b>Objectives/Goals</b> An explosion occurred in the Gulf of Mexico in 2010 due to sinking polluted soil. The use of chemicals and human industrial activity contributes greatly to soil contamination. Soil pollution affects all aspects of life and is a major cause of famines, illnesses, and countless other negative effects. The goal of this project was to combat soil pollution using natural adsorbents made from common and recyclable household waste. <b>Methods/Materials</b> This experiment was performed in three main parts. In Part 1, we studied the effects of different types of soil (organic, non-organic, backyard) and water (50 mM HCl, distilled, tap) on changes in pH and TDS. In Part 2, we tested how different metal contaminants (salts of copper, cobalt, nickel, zinc) affected the salinity of soil, which directly impacts soil fertility. In Part 3, we created adsorbents using different combinations of fruit peels (household waste) and tested them in the removal of $\text{CoCl}_2$ from soil. We used different ratios of grapefruit, mango, and avocado peel to create four batches of adsorbents. Adsorption experiments were performed using soil leachate solutions containing various amounts of $\text{CoCl}_2$ (0.01, 0.025, 0.05, 0.075, 0.01 g/mL water) and the batches were added into the soil leachate solutions separately. After filtering out the adsorbents, the absorbance of the unadsorbed cobalt chloride was measured using a spectrophotometer. The same protocol was performed for two different contact times. The efficiency of the chosen adsorbent was tested through the growth of a plant. To ensure accuracy of the data, we performed four trials for each experiment. <b>Results</b> Non-organic soil and tap water showed maximum resistance to pH and TDS changes (Part 1), and $\text{CoCl}_2$ raised the salinity of soil the greatest (Part 2). We continued with these controlled variables in Part 3. The final results showed that Batch 3 (20% grapefruit, 20% avocado, and 60% mango peel) adsorbed over 94% of the $\text{CoCl}_2$ in 60 minutes. <b>Conclusions/Discussion</b> The results reveal that the most effective adsorbent was Batch 3, supporting the hypothesis that fruit peels are an effective adsorbent for removing soil pollutants. On a large scale, the implementation of natural adsorbents would be a better alternative to modern agricultural practices that are used to lessen soil pollution since this is a natural, cheap, convenient, and effective way to extract soil pollutants out of land.	
<b>Summary Statement</b> This project aimed towards using biodegradable adsorbents made from common and recyclable household waste to provide an efficient alternative to removing soil contaminants.	
<b>Help Received</b> My science teacher, Mrs. Okenwa, overviewed my documents and procedures. Dr. Kanika Sharma Mitra advised me in some of the common procedures performed in adsorption experiments so that I can better understand how to design the procedure.	