CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Isabella U. Hurvitz

Project Number
S1114

Project Title
How Can Adsorbent Materials Be Utilized for Pesticide Elimination?

Abstract

Objectives/Goals
The objective of the project was to evaluate how well activated carbon, graphene oxide, and Mag-PCMAs serve to adsorb pesticide contaminants, in order to ascertain the potential of using the materials to remove pesticide agents from agricultural runoff and contaminated surface water.

Methods/Materials
The experiment tested the efficiencies of the selected adsorbents against 14 unique pesticide agents. The initial pesticide concentration was varied 4 times, and each sample had a constant 10 mg of the adsorbent material added. Two duplicates were created for each solution, and each initial concentration had a sample labeled as control with no added adsorbent. After mixing, the final concentrations were measured using a Liquid Chromatography-Mass Spectrometer. The removal efficiencies of each adsorbent at the different initial concentrations were found, by comparing the sample to the tested controls, then these removal efficiencies were averaged and the results were analyzed.

Results
The data demonstrates that all three additives had an effect on the pesticide agents which caused a reduction of the pesticide content, and therefore supports that they are all particles with adsorbent properties. On average all 3 adsorbents were able to reduce at least 15% of the pesticide content of the solution, however, the large std. deviations of the graphene oxide and the Mag-PCMA indicate that the efficiencies were not consistent for these adsorbents, meaning that some of the pesticide were more resistant than others. The granular activated carbon had consistently high removal efficiencies with lower standard deviations, indicating that the activated carbon was highly efficient on the majority of pesticides with less variation, compared to the other adsorbent materials.

Conclusions/Discussion
Overall, it was found that the activated carbon was the most efficient adsorbent particle of the majority of pesticide agents. Future steps that could be taken to improve this research would be to expand the range of adsorbent materials to a broader comparison of carbon based adsorbent particles, and include analysis of the removal efficiencies under varying physical and chemical conditions. The ultimate implications of the investigation would involve engineering a system containing the adsorbent particles, specifically the activated carbon, to allow for the adsorbent particles to remove pesticide content directly from the environment.

Summary Statement
The objective was to evaluate how well activated carbon, graphene oxide, and Mag-PCMAs serve to adsorb pesticides, in order to ascertain the potential of using the materials to remove pesticide agents from contaminated water.

Help Received
My mentor for this project is Dr. Arturo Keller, a professor of biogeochemistry at the UCSB Bren School of Environmental Science. Dr. Keller has contributed by allowing me access to his lab and equipment, as well as, answering my supplemental questions.