CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
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Project Number
31836

Project Title
Using Magnetic Particles to Remove Lead Ions from Water

Abstract

Objectives/Goals
Lead is a potent neurotoxin that does not break down in the environment and is very hard to clean up. It is extremely harmful to the nervous system, especially in small children. This project was designed to remove lead ions from an aqueous solution using negatively charged magnetic particles # specifically iron filings. I hypothesized that if the surfaces of the iron filings are chemically manipulated to acquire a negative charge, then the positively charged lead ions (Pb2+) can become attached to the surface of these magnetic particles and can thus be removed from solution using an external magnetic field.

Methods/Materials
For this experiment I used beakers, 15 mL vials, iron filings, .5 M Sodium Chloride, .5 M Ammonium Hydroxide, 1 M Sodium Hydroxide, and .5 M Lead (II) Nitrate, Distilled Water, an electronic scale with weighting paper, magnets, masking tape, pipettes, and graduated cylinders.
After treating the iron filings with the different base solutions for 24 hours I added 4 mL of lead (II) nitrate and left them in contact for different amount of time. I would then remove the lead and add NaCl to form Lead (II) Chloride.

Results
As the reaction time between the contact of the lead solution and the iron filings increased so did the amount of lead removed. After 4 hours of contact time however, there was no significant removal of lead.

Conclusions/Discussion
In conclusion the results of my experiment supported the idea of using an external magnetic field to remove lead ions from the solution. Furthermore the efficiency of this project depends on the amount of reaction time between the iron filings and the lead ions. According to my results a reaction time of 4-6 hours is sufficient to remove 1 M lead ions concentration from the solution. However, I believe if the amount of magnetic particles is greater the reaction time could be shorter. The reason why I chose to use magnetic particles to remove lead ions was to test for a way to remove lead ions from water. People mainly concentrate on lead solids and their removal using filters to remove them, but lead solid is not the only kind of lead that pollutes the waters. Industries such as those in metallurgy are known to dump acidic solution of lead into water, effectively preventing lead from becoming solids. This method could be used in industries to remove the lead ions and prevent the pollution of waters in homes and the environment

Summary Statement
My project was about the removal of lead ions from an aqueous solution using a method other than filtration, one that

Help Received
AP Environmental Science teacher supplied lab equipment and information on chemicals.