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Environmental Impact Assessment of the Missouri Mine

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Abstract

Gold mining in Idaho and other western states has left a legacy of heavy metal contamination. These metals enter the food chain via plants and water, and are toxic to living organisms. There is a need to identify and map the heavy metal contamination, and to track the fate and transport of heavy metals from one mine site to another via surface waters. Our hypothesis is that the severe contamination in the area of the Missouri Mine is not all from that site, but includes heavy metals transported in surface water from another mine to the northeast, in the Summit Flat area. To test this hypothesis, samples of soil, water, sediment and vegetation are taken throughout the affected area. They are analyzed via Atomic Absorption spectroscopy for the target metals, using standard USEPA methods. Then a map of the contamination is prepared. If amounts of EPA criterion pollutants exceed acceptable levels, the results will be reported to appropriate government agencies.

Keywords

adit drainage, contamination, acidification

Disciplines

Environmental Chemistry

Missouri Mine: Analyzing Effects of Contamination

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Problem / Question

Adit drainage from the mine contains hazardous elements such as mercury due to the leaching process and from mineral composition of the mountain. The drainages from the Missouri mine are barren leading us to believe there is more contamination in the water.

Hypothesis

- Water from runoff and from up river is introducing more contaminants into the area, specifically the adit drainage of the Missouri mine. We now know this is not the case.
- Our new hypothesis is that the SOx and NOx emitted from the mine are what has caused these environmental issues. Also, hexaaquairon(III) ion is a major contaminant. Both of these cause very acidic condition.

Project Overview

Analysis will be done using EPA standard methods.

Elements to be screened for will be mercury, lead, cadmium, arsenic, and gold.

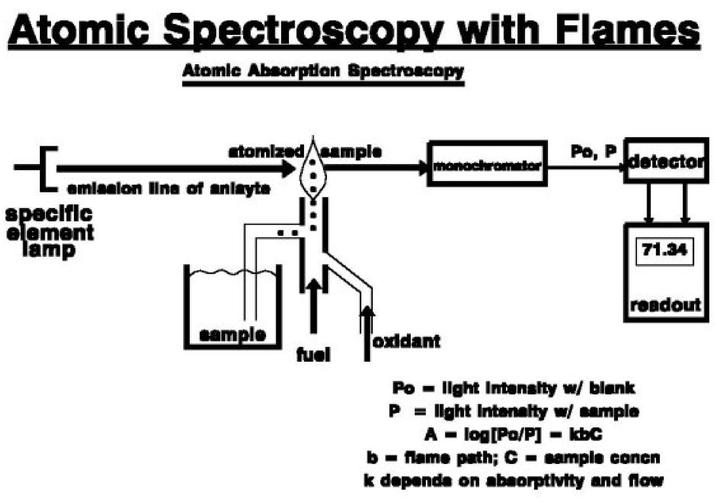
Atomic absorption spectroscopy will be used to quantify these metals.

The cold vapor method will be used to quantify mercury levels.

The rest of the metals will be quantified with standard AAS.

A pH profile of the drainage area will be conducted to monitor acidity.

AA with Flame Method



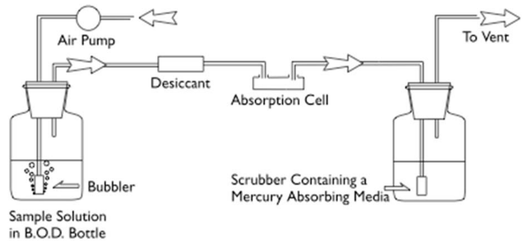
Future Work

We plan on mapping out the spread of the heavy metal contamination. We plan on sampling the area with Ziploc plastic bags labeled with the grid area and standard sampling scoop. Sample procedure will be according to standard EPA guidelines. Both soil and water samples will be acquired from a statistically planned grid. We will analyze for pH and for heavy metal contamination of Fe, Hg, As, and Cd.

Working Conclusion

Currently our working conclusion is that the run off from other mines has not caused the acidification and heavy metal contamination. This is apparent by previous research done that shows no signs of contamination in the creek that connects the two mines.

Mercury Cold Vapor Method



Mercury cold vapor method.
A water sample or wet-ashed mineral sample is placed in the bubbler. Mercury is in the Hg(II) state. A reducing agent, Sn(II), is added causing this reaction:

$$Sn^{2+} + Hg^{2+} \rightarrow Hg^{0}\,(g) + Sn^{2+}$$

Inert gas purges Hg^{0} (g) into the spectroscopy cell, where the atomic absorption is measured.

The Adit Drainage

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Goal of Research

- Profile adit drainage for hazardous elements.
- Form a gradient map of the pH for the drainage.
- Determination contamination levels of nearby water sources.
- Monitor levels of contaminants to ensure levels aren't increasing. If they are increasing then it will be necessary to find out how it is occurring.

Works Cited

- Cold Vapor Method: http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCsQFjAA&url=http%3A%2F%2Fwater.epa.gov%2Fscitech%2Fmethods%2Fcwa%2Fbioindicators%2Fupload%2F2007_07_10_methods_method_245_1.pdf&ei=X1JNU9-4I6PsyQHvh4GgBA&usg=AFQjCNH9bMyses4IMhZggau1vkeYJ9xtWQ&sig2=ZaJo_b9fAPTcMjQsrP8ncQ&bvm=bv.64764171,d.aWc
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