



**CALIFORNIA STATE SCIENCE FAIR  
2009 PROJECT SUMMARY**

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**Project Title**  
**Electrical Cleavage of Mineral Ore: A Series of Tests Seeking to Extract Metals from Ore by Electrolysis**

**Abstract**

**Objectives/Goals**  
 If an electrical current passes through an ore that contains certain metals, while in a saline solution, then metals will be emitted off the ore in small molecular amounts.

**Methods/Materials**  
 Roughly 50 pounds of Barium ore were extracted from an abandoned open pit mine in the High Sierras. The ore was cut into small cubes using a rock table saw. The actual size of the barium ore cubes varied slightly. A circuit with a switch was built using a 6-volt battery. The wire coming off the switch had an alligator clip soldered on, that held a conducting rod. A 4-oz container filled with 4 tbs of saltwater was placed in the circuit. The rod was placed in a stable position in the saltwater through a hole drilled in the lid. The ore samples were dipped into the salt solution and placed in a large alligator clip and dangled from the lid through a second hole in the container lid. The ore sample was suspended in the salt water near the rod. The lid was placed on top of the container holding the salt solution. The clip with the rod was placed into the salt water through the hole drilled for it. A timer was set for the specific test time limit (1, 2, 3, 4, 8 and 12 hour tests). Both timer and switch were turned on simultaneously. After testing, the circuit was turned off, and the rock dried. Test products were taken to a radiology unit where they were x-rayed for metal extraction evidence. Samples were then taken to the Edwards AFB#s Hazmat Lab, where they were processed by an ICP-MS, which analyzed the amount of Barium in the ore.

**Results**  
 After all of the ore samples were tested they were re-weighed; all of the samples weighed the same as they did before tests were conducted. The x-rays revealed no additional information due to the high amounts of salinity in the solutions. Fortunately that was not a problem for the ICP-MS.

ICP-MS Results (concentrations are in ug/L)

Container-	1	2	3	4	5	6	7	8	9	10	11	12
Barium-	12400	1609	13141	2698	8696	3217	4301	5360	2829	3480	9424	33058

Though the amount of Barium varied in the tests. There was still plenty of evidence that there was barium emitted from the ore samples. In fact, roughly 33,000 ug/L of Barium was found in test 12.

**Conclusions/Discussion**  
 Overall, the data did support the hypothesis, barium was extracted from the ore samples through electrolysis.

**Summary Statement**  
 The purpose of this project is to create an easier and safer way for miners and scientists to extract metals from ore.

**Help Received**  
 Father helped type report; Used lab equipment at a BEAL lab; a friend helped me learn the basics of electrolysis, Used x-ray machine at Edwards AFB Clinic