The Cincinnati Group Discloses Its Radioactivity Remediation Protocol...

and begins to *Sell* LENT™ (Low Energy Nuclear Transmutation) KITS

—A report written and compiled by Eugene Mallove, Sc.D.—

An Ohio group of inventors, *The Cincinnati Group*, first talked about in *Infinite Energy* Issue #5&6, is now completely confident of its simplified and *low energy* nuclear transmutation process for converting thorium to a range of lower atomic mass products. Thus, they claim to accomplish within minutes-to-hours what Nature requires tens of billions of years to do—at a cost of mere pennies of electrical energy input. (The half-life of thorium-232 is 14 billion years.) No exotic materials—except zirconium metal electrodes—are required.

Exhaustive testing over the past two years has improved the reliability of the process and led to confidence by the group that it is real, robust, and repeatable at will. The technique has been checked at independent laboratories. To get an idea of the excitement being generated by spreading news of the process, one laboratory person at the Illinois Department of Natural Resources Waste Management and Research Center in Champaign, Illinois exclaimed in his preliminary testing report: "I'm having a devil of a time believing the data— unless you are aware of some sources (other than transmutation), but the isotopic scans are showing this is real!"

More such checks are underway at government-affiliated labs in the state of Washington (Pacific Northwest National Laboratory, PNNL—operated for the DOE by Battelle). If the process should be extendible to other radioactive materials, such as plutonium, cesium, strontium, etc., as seems likely to them, the group hopes to earn significant revenues by licensing the process to large corporations that are already working on conventional nuclear waste reduction systems—typically by encapsulation and geological burial.

Because Florida-based Clean Energy Technologies, Inc. (CETI) also says it has convincing proof of its own patent-pending low-energy nuclear waste remediating process, and has presented its findings at a special session of the American Nuclear Society meeting last June (as well as on national television), gives a large measure of confidence that *The Cincinnati Group's* work is for real. The CETI process, though different, is also electrolytic. It is, in effect, an independent check on the Ohio work. Conventional physics says *neither* process should work, but they both appear to work repeatably. CETI also is having its processes checked out at the Hanford, Washington— a major site of nuclear waste disposal activities.

The Cincinnati Group has applied for U.S. and foreign patent protection, but it believes it is in the interest of all concerned—all humanity—to reveal the protocol for the process. We are proud to be able to provide it right now in this article (see adjoining material and diagrams). It is in the form of a sample run, an exploded-view diagram of the pressurized cell, and a few experimental parameters—such as the solution concentration of the thorium nitrate material used as a test medium.

This disclosure should allow many laboratories to confirm the process. Simultaneously, the group has begun to offer a Low Energy Nuclear Transmutation Kit (*LENT-1*) for sale. Deliveries are scheduled to begin this fall. The group will support kit purchasers with technical assistance to make sure success is achieved. A final assurance is the group's money-back guarantee.

This major commercial development should prompt a world-wide effort to verify *The Cincinnati Group's* claims. This modern-day incarnation of alchemy is obviously a profound and shocking claim to be making—much more dramatic in many ways than the now amply verified original Pons/Fleischmann cold fusion claims. Even if the process occurs in a simple electrolytic cell, the theoretical energy release of transmuting a significant fraction of a gram of thorium to lighter products—by conventional understanding—should be enormous. But the group has experienced no large apparent energy releases with its process. It appears to be *athermal*, though calorimetry will have to be done to determine whether there is any excess energy at all.

Moreover, the process has been checked this summer at a DOE-connected laboratory (PNNL) and found to produce *no* detectable neutron or gamma ray emissions while the closed-cell device was operating. The process, if real, is certainly *aneutronic!* The very idea that the high Coulombic barrier (electrical repulsion) could be broken done so easily and safely, with such a beneficial result, is patently *unthinkable* in the context of conventional physics. In fact, that there were no high-level neutron emissions involved in the Pons-Fleischmann process was widely used as a criticism of the Utah claims. We will now have to see whether other groups bring forth widespread validation of the process being put forth by *The Cincinnati Group*.

Several Laboratories have already participated in testing the before and after materials of the experiment and find remarkable agreement that a huge percentage (often over 90%!) of the pre-existing thorium has disappeared from the closed-cell chamber. The thorium has converted to such lower-mass nuclides as copper and titanium. No doubt lighter elements are produced too—not all accountable for by the ICP/MS (Inductively Coupled Plasma/Mass Spectrometry) measurement devices employed. And, there is much evidence provided by *Cincinnati* of non-natural isotope abundances in the products—such as the copper-65 versus copper-63 ratio being changed 2,000%, and reversed. Cell contents have been elaborately scoured and counted for radiation remaining to insure that radioactive material is not simply being "hidden" by an unknown process within chamber components. See in this report, in particular, the extensive commentary on testing procedures by Robert Liversage of Data Chem.

If the past is any guide, it helps to have *some* theoretical physics framework under which *The Cincinnati Group's* process might be understood. Physics Professor Robert T. Bush of California Polytechnic University, Pomona, has put forth a cold fusion/cold fission mechanism that may explain what is going on. In this issue, he gives a brief extract and overview of his theory.

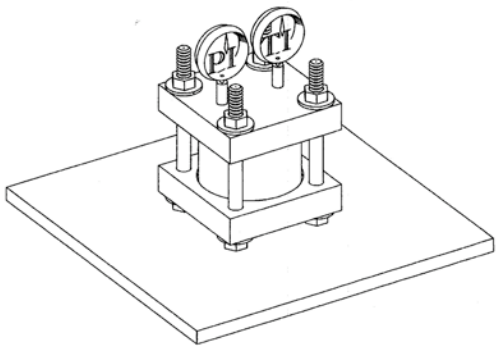
Bush's colleague, Physics Professor Robert Eagleton at Cal Poly, Pomona, who has worked with *The Cincinnati Group*, also has envisioned another interesting theory. We hope to publish it some time in the future. Professor Eagelton's "Multi-proton Coherent Resonant Absorption" idea and Professor Bush's ideas may be right or they may be wrong, but they are at least places to start. We are sure that theoreticians in the cold fusion field will have a *field day* creating alternative theories—the more the better! Dr. Robert Bass, a cold fusion theorist himself, provides some commentary on the Eagleton theory.

Protocol for Thorium Activity Remediation

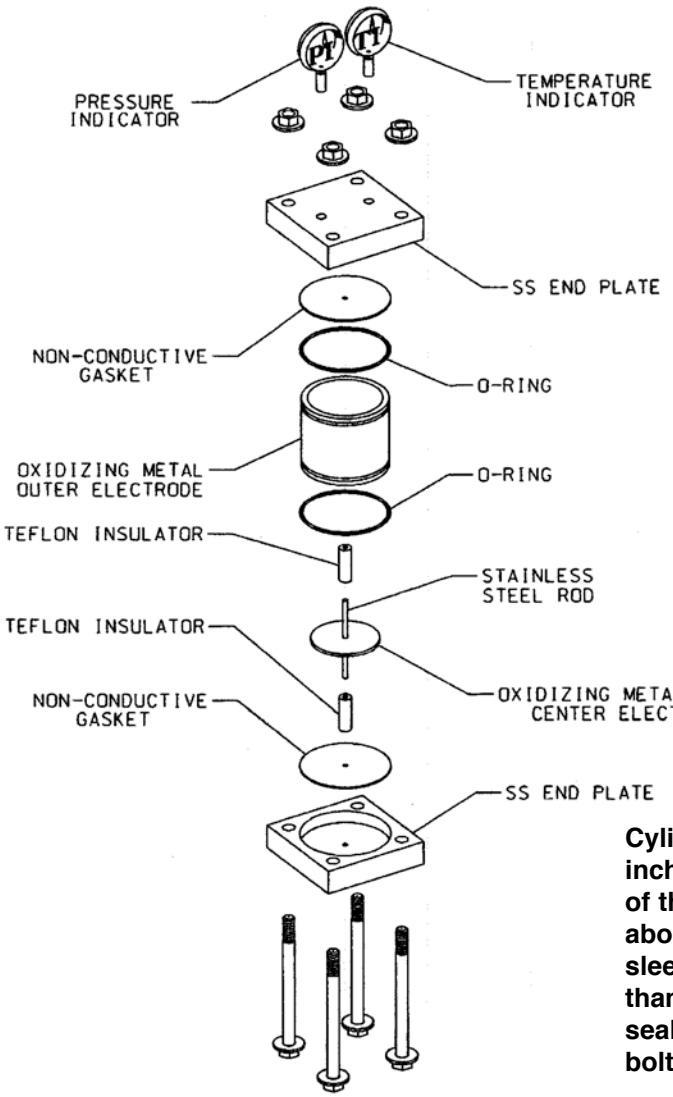
Data and Diagrams Courtesy, *The Cincinnati Group*

CAUTION

This experiment should be done *only* in a safe, qualified laboratory with experienced personnel. There are electrical hazards—and temperature and **pressure hazards**, in addition to the presence of mildly radioactive materials. Cell pressures can range to 4 atmospheres and beyond. So the electrolytic cell must be constructed with appropriate safety factors. Neither The Cincinnati Group nor *Infinite Energy* are responsible for the consequences of unsafe laboratory practice. Better yet, purchase a **Guaranteed** LENT-1 kit from The Cincinnati Group (see ad, page 5).



Low Energy Nuclear Transmutation Cell
Showing Temperature and Pressure Gages



Note: This cell is depicted in a vertical, exploded-view. However, it must be operated *horizontally*. Also: The pressure and temperature gauges are not used. They are only for purposes of suggesting that pressure and temperature should be monitored for scientific *and* safety reasons. The CG uses a thermocouple on the exterior of the cell and a chart of temperature/versus pressure from thermodynamic tables. In this way, the cell interior is intact. No leakage can occur into any gauges.

Cylinder diameter is 1.5 inches. Overall length of the assembled cell is about 4-inches. Teflon sleeve is slightly longer than SS rod— for tight sealing of the rod when bolts are tightened.

Typical Current-Voltage Profile for Remediation Experiments

Test #2, June 27, 1997

Cell contents: 25 milliliters made from a solution perpared as follows:
100 milliliters of distilled water, 1 drop of HCl, 1 gram of thorium nitrate. AC power (60 Hz) to zirconium cell pictured in adjacent exploded-view. Voltage and current relationships as follows:

Time (min)	Current (amps)	Volts (V)	Temp (°F)
0	1.94	47	71.4
1	1.31	49	75.4
3	1.16	49	86.0
4	1.20	49	90.8
5	1.27	49	93.4
6	1.36/2.65	46/60	98.0
7	4.58	55	115.0
8	8.18	44	161.0
9	8.25	44	204.2
10	7.50	46	235.8
11	5.76	53	255.2
12	3.90	59	262.6
13	2.70/2.90	59/72	258.4
14	2.30/2.20	74/85	251.0
15	1.83/1.97	86/110	245.2
16	1.55/1.55	111/120	242.8
17	1.37/144	120/136	240.0
18	1.28/1.34	136/150	237
19	1.24/1.31	150/168	237
20	1.29	168	240.2
21	1.23/1.26	168/177	243.0
22	1.24	177	246
23	1.24	177	250.2
24	1.26	177	253.6
25	1.30	176	257.9
26	1.32	176	261.6
27	1.36	176	265.6
28	1.40	175	267
29	1.44	175	274.8
30	1.49	176	277.4

The zirconium pipe electrode is 1.5 inches in diameter, with an approximately 0.125-inch wall-thickness.

Attach one leg of an AC (60 Hz) power supply to "oxidizing metal" (zirconium) cell chamber (outer electrode). The other contact to the power supply goes to the other electrode inside the chamber (the "oxidizing metal washer"—zirconium)—the current path goes through the teflon-shielded stainless steel rod. **NOTE WELL:** The cell with 25 ml of solution in it must be operated *horizontally*—with the axis of the cylinder parallel to the ground— for best results.

NEWS RELEASE Monday, June 16, 1997
LOW-ENERGY BULK-PROCESS ALCHEMY

One-Tenth Gram of Thorium Becomes Titanium & Copper

Most Sacrosanct Principles of Physics Overturned — (Transmitted by Dr. Robert Bass)

CINCINNATI, OHIO:

In a stunning upset of the fundamental dogmas of high-energy nuclear physics, a small group of inspired inventors, acting in the tradition of the Wright Brothers of nearby Dayton, Ohio, has achieved reliable, multiply-confirmed, replicable-upon-demand, low-energy, bulk-process, high-speed, dirt-cheap, modern alchemy. For example, in less than an hour, one-tenth gram of radioactive thorium has been transmuted into nine-hundredths gram of titanium plus one-hundredth gram of copper.

After two years of partial public disclosures, these latter-day Prometheans have finally achieved multiple third-party confirmations by numerous established measurement techniques and cross-checking procedures to rule out irrefutably all possibility of contamination or other experimental error, and are now calling for the public to encourage the Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), and the Department of Energy (DOE), to pay attention to their unprecedented technological breakthrough, which seems providentially to have arrived at the height of national concern over the expensive and dangerous problem posed by disposal of massive stockpiles of radioactive wastes produced both by the Department of Defense (DOD) atomic-weapons program and by the nation's many civilian nuclear power-generating plants.

Conventional-minded physical scientists have long- proclaimed low-energy bulk-process transmutation of one chemical element into another to be a flatly impossible "ancient and medieval dream" whose absurdity has been exposed by modern discoveries concerning the structure of the atom and its nucleus. Supposedly only multi-million- dollar high-energy particle accelerators, operating at energies in excess of tens of thousands of electron volts in expensive national laboratories, can perform nuclear alchemy, and that only in invisible amounts too small for ordinary comprehension or practical utility.

In contrast, the new process announced by the Cincinnati Group (as it is known to the few thousand remaining followers of the long-smoldering cold fusion controversy) could be reproduced in any high-school laboratory. The total power required to transmute one tenth gram of thorium is less than 300 watts, and the processing time is under an hour, so less than three-tenths of a kilowatt-hour (or less than three pennies' worth of electricity) is the energy requirement. The patent-pending, proprietary reaction vessel, whose technical secrets will be made available for independent replication by others as soon as the Patent issues (or at once, to serious investigators, under a standard Non-Disclosure Agreement [NDA]) ***[EDITOR's NOTE: The Cincinnati Group later decided to disclose its protocol this summer—in this issue of Infinite Energy.—EFM]***, fits inside of a four-inch cube. Initially five identical processing cells were fabricated, after the process was discovered by trial-and-error in one corner of a welding shop. The process has never failed to transmute at least eighty percent of one-tenth gram of thorium metal in under one hour at an energy cost of less than three-tenths of a kW-hr. Other elements, such as ultra-dangerous cesium-137, and uranium, also have been processed with similar results, auguring hope that mankind's Faustian-bargain nightmare of long-lived high-level radioactive waste can at last be eliminated. Different sizes of cells have been constructed and operated successfully, indicating that the process can be scaled up from grams to tons at will.

The objective is to convert a radioactive element into non-radioactive elements, which happens in nature over millions or billions of years depending upon the particular "radionuclide" under consideration. For example, in nature, uranium and thorium decay, by emission of alpha- &-beta-particles, in a long and complicated chain of reactions which stops only when the final decay products are isotopes of lead. It takes thorium ten half-lives, or 45 billion years, for 99.9 percent of any sample to decay naturally into lead. However, the new process causes random, multiple fragmentation of the thorium nucleus into elements which are non-radioactive when first created, thereby drastically speeding up the process by eliminating the need for further radioactive decay.

In one particular run, thorium was transmuted entirely into titanium and copper, within experimental error of the measuring instruments. In this case, the transmutation result consisted of ninety-percent titanium and ten-percent copper. In other runs, the result was almost entirely copper, with a small amount of titanium and iron. In one particular test, the result was about one-tenth of a gram of flakes of copper, which could be seen with the naked eye and picked up with tweezers! A color photo of this man-made copper is available. ***[Editor's Note: See this issue of IE for black and white photo.—EFM]*** The fact that this could not have been due to contamination was subsequently ruled out by processing cell blanks along with the thorium test samples, in which the only difference in the solutions placed into the reaction vessel was the presence or absence of dissolved thorium nitrate. Moreover, the clinching evidence that the copper could not have been the result of error or hoax was that its isotopic abundance ratio was discrepant from that of natural copper by about two thousand percent!

In naturally-occurring copper, the abundance of the isotope of atomic weight 65 (meaning that there is a total of 65 protons and neutrons in its nucleus) constitutes about 45 percent of the amount of the copper isotope of atomic weight 63. But in the test-run which produced macroscopically visible copper flakes, the abundance ratio was increased by a factor of 21.7 to a staggering 973 percent! Likewise two of the four isotopes of titanium in another run were hugely discrepant as regards natural isotopic abundance ratios. To produce one-tenth of a gram of copper and titanium isotopes, so out of alignment with what occurs in nature, suggests to those familiar with the difficulty of separation of other metallic isotopes that would-be hoaxers are facing a mini-Manhattan project, which is obviously far beyond the resources of private individuals working on a modest budget. This single piece of evidence alone precludes the possibility of hoax or error. ***[Editor's note: It is possible to "doctor" a sample with commercially available isotopes, but in this Editor's opinion, there is <u>zero chance</u> that this is an instance of fraud.—EFM]***

However, the Cincinnati Group, remembering the violent skepticism which greeted the claims of Fleischmann & Pons in 1989 to have demonstrated "cold" nuclear fusion of deuterium into helium by electrolysis in a simple electrochemical cell, have subjected their process to the scrutiny of every known sophisticated measurement

process, at both a nationally prominent testing laboratory and two nationally reputable universities, with confirmatory results. The before-and-after testing of the process-sample has employed both quadrupole mass spectrometry (utilizing an inductively coupled plasma excitation source) and atomic-emission spectrometry (based upon scanning electron microscopy). Also used were Geiger counters (to note decrease in external counts during processing) and computer-monitored scintillation counters for more accurate quantitative measurements of initial and final radiation emission by the bare ***[Editor's Note: Dried samples, obtained from the cell solution, were used.–EFM]*** unprocessed and processed samples themselves.

The basic protocol involves dissolving one gram of thorium nitrate in 100 milliliters (ml) of double-distilled water and other reagents. Then 75 ml is retained for testing as a "before" or unprocessed sample, while 25 ml is inserted into the reaction vessel. Electric current is run through the cell for less than one hour. The contents of the cell are then collected for testing as an "after" or processed sample.

To ascertain that no radioactive elements remain in the cell, it is disassembled and each part monitored for radioactivity. Additionally, one unused cell was ground up, dissolved in acid, and the digested mixture tested [by ICP/MS & TEM-EDXA] to ensure that no contaminants sufficient to produce the observed amounts of copper, titanium, etc. were present. Furthermore, even though such amounts of contaminants were already known not to be present, and yet to double-check under the fictitious assumption that they might have been present, and that ablation, leaching and/or possible transmutation of some of the elements of the cell itself might have led to error in the results, a blank test was also prepared and subjected to the reaction process, in which the sole difference between the blank run and the actual run was the absence or presence of thorium nitrate in the solution introduced into the reaction chamber. Most of the mass-spectroscopy analyses were done on four separate but related samples: (1) a reagent blank [whose results were subtracted from the following results]; (2) a cell blank [as already described]; (3) a processed sample; and (4) an unprocessed sample [from the same initial batch]. The conclusion about what percentage of the thorium had been transmuted was based upon comparison of items (3) and (4).

One of the many runs based upon the protocol just described led to a "Third Party Verification" Certificate which reads in part: "The quantitative analysis of the data indicated that the amount of thorium which had undergone transmutation was equivalent to the amount of titanium plus copper which had been formed, within experimental error."

Traditionally, science has been based upon openness and peer-reviewed publications, with no details omitted, and widespread acceptance contingent upon independent replication and confirmation. Unfortunately, basic science as practiced today is almost entirely dependent upon public funding, such as from the National Science Foundation (NSF), NASA, or, as already mentioned, the DOD and DOE. But in the case of cold fusion (CF), which is a special case of the present subject of Low Energy Nuclear Reactions (LENR), the Energy Research Advisory Board (ERAB) Report submitted to the DOE and essentially claiming that CF/LENR and the like are "physically IMPOSSIBLE" has precluded normally funded research in this emergent field. Therefore it has been all bootlegged or privately funded by small entities.

The Cincinnati Group, operating upon a shoestring, and obtaining results which the august National Academy of Science (NAS), in an elaborately expensive study and report to the DOE on the subject of cost-effective radioactive waste elimination by transmutation, has branded as essentially "inherently physically impossible," has no choice but to seek Patent Protection for its intellectual property in order to attract the necessary venture capital by means of which this almost-miraculous process can be scaled up from grams to pounds and, eventually, to tons.

Concerned citizens, who would like to see "a twenty- first century science solution" to the agonizing national problem of Radwaste Remediation (RR), should urge their Senators to encourage the Assistant Commissioner for Patents of the USPTO to strongly encourage Art Group 220 to expedite the issuance of CF/LENR patents. Only when the dead hand of the Establishment is taken off the necks of America's real creators, the small, independent inventors, and the Patent System functions in the manner which the founding fathers of this country intended when they authorized it in the Constitution, can the average citizen-taxpayer benefit from such breakthroughs as that now announced by the Cincinnati Group.

In conclusion, the Cincinnati Group wishes to express its appreciation to those who have helped it the most, starting with those elements of the national press who do not cater to "pack mentality." They would not have started their project if it had not been for the courageous decision of the Editors and Publishers of *Popular Science* magazine, breaking with their colleagues at *Nature*, *Science,* and *Scientific American*, to feature as a cover story [August 1993] "Cold Fusion: It Ain't Over Til It's Over!," a hard-hitting unbiased account of the CF scandal by *Wall Street Journal* reporter Jerry Bishop. From this article, the Cincinnati Group learned to contact Dr. Hal Fox, founder of the Fusion Information Center [P.O. Box 58639, Salt Lake City, UT 84158-0638], who advised them that the nation perhaps needed RR more desperately than cheap, clean energy at the present time. Fox, who publishes the archival, internationally Abstracted, peer-reviewed *Journal of New Energy*, also publishes a *CF Source Book*, which he has dedicated to "The Children of Chernobyl." The Cincinnati Group further publicly acknowledges great help from Dr. Eugene Mallove, publisher and editor of *Infinite Energy* magazine [available for an annual subscription of $29.50 from P.O. Box 2816, Concord, NH 03302-2816], whose next issue will contain much more detail pertaining to the presently announced seemingly-miraculous achievement. Persons with a scientific interest who would like to peruse unedited copies of the Test Reports summarized above (or contemplate signing an NDA in order to receive full disclosure) may contact Celine at P.O. Box 1262, Covington, KY 4172-1262 or, M-F, at (513) 244-1144. After June 19, the merely curious may consult the Cincinnati Group's forthcoming web page.

-END-

Transmitted by: Dr. Robert W. Bass, Registered Patent Agent 29,130 [ex-Prof. Physics] Inventor: Topolotron, Plasmasphere, issued; QRT Cold Fusion, pending P.O.Box 1238, Pahrump, NV 89041-1238; phone/FAX (702) 751-0932/0739 Voice-Mail: (702) 387-7213

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Dr. Robert W. Bass at ICCF5, Monte Carlo, 1995
(Photo: Eugene Mallove)

Third-Party Verification of Cincinnati Group's Thorium Transmutation Process
Letter by Robert Liversage Describing Methodology

06/05/97

To Whom it May Concern:

My name is Robert Liversage. I have been asked by Mr. Stan Gleeson of The Cincinnati Group to perform a third party verification of a technology his organization has developed for the purpose of transmutation of radioactive elements into nonradioactive elements.

I was granted a Bachelor of Science in Honours Chemistry by the University of Waterloo, Waterloo, Ontario, Canada in 1981. I was granted a Master of Science in Chemistry by the University of Toronto, Toronto, Ontario, Canada in 1984. I have thirteen years experience in the field of analytical Chemistry, specializing in atomic spectroscopy. My experience, which is most pertinent to this validation process, is five years performing methods development and sample analyses on the Perkin Elmer/Sciex Elan 250 Inductively Coupled Plasma/Mass Spectrometer (ICP/MS) system I was employed by Sciex, the company which manufactures the instrument, as their Applications Specialist for two and a half of the five years.

ICP/MS was the primary analytical technique used to perform the evaluation. The other technique employed was scintillation counting. A brief description of the types of information each technique provides will be discussed below. The value of using more than one analytical technique is that the results obtained from each should complement and substantiate the other. If transmutation is occurring, we can predict the types of *analytical evidence* we should obtain from each of the techniques used. If either technique produced data which is inconsistent with our expectations, it would raise doubts as to the validity of the transmutation process, and further investigation would be required. Conversely, if both techniques yield the predicted results, the combined data provides substantial proof that transmutation is occurring.

The Perkin Elmer/Sciex Elan 250 was the ICP/MS system used to perform this evaluation. The program used to generate the data is called *total quant*. The total quant program performs a quantitative elemental and isotopic analysis of approximately ninety-five percent of the elements on the periodic table In addition, if any non-naturally occurring radioactive isotopes were synthesized by the transmutation process, they may also be detected. The Cincinnati Group chose to use a solution containing approximately 0.3 percent thorium nitrate plus a few drops of hydrochloric acid in double distilled water as their test sample. The solution was split. One portion was set aside, and the other portion was subjected to the reaction process. In order to discriminate between the elements present in the processed sample which are due to transmutation of thorium from those which may be due to ablation, and leaching and/or possible transmutation of thorium materials used to construct the reaction vessel, a blank was also prepared and subjected to the reaction process. The **preparation-blank** contained a few drops of hydrochloric acid in double distilled water. The preparation blank was subjected to the same reaction parameters as the test solution.

The quantitative analysis of the data indicated that the amount of thorium which had undergone transmutation was equivalent to the amount of titanium plus copper which had been formed, within experimental error.

Consequently, the only difference between the preparation blank run and the test sample run was the presence of thorium nitrate in the test sample. If significant transmutation of thorium is occurring in The Cincinnati Group's reaction vessel, comparison of the *total quant* results obtained for the before-processed and after-processed test solutions should show a substantial reduction in thorium concentration. Comparison of the preparation blank data and the after-processed test solution should show a significant increase in concentration of one or more elements in the after-processed solution. Elements which are not detected in the preparation blank at all may be observed in the after processed test solution Finally, if quantitative-transmutation of thorium is occurring, the analytical evidence may also include significant deviations from the natural isotopic abundance ratios for the elements which are present in the after-processed sample due to transmutation The isotopic-ratios of elements in naturally occurring substances is considered to be a constant, and well defined. If fission of thorium is occurring, we might expect random fragmentation into lighter isotopes. Random fragmentation may yield altered isotopic abundance ratios. Altered isotopic abundance ratios would be an additional significant indication that transmutation has occurred.

Comparison of the processed test solution with the unprocessed test solution data showed that 80% of the thorium placed in the reaction cell had undergone transmutation. Comparison of the cell-blank data with the processed test sample data indicated that significant quantities of titanium and copper had been produced. The concentration of titanium in the processed sample was 10 times greater than the copper concentration. In addition, significantly altered isotopic ratios were observed for both elements. Copper has two isotopes at mass 63 and mass 65. The natural abundance ratio of mass 65 to 63 is 0.45. The ratio observed in the processed sample was 8.2. This represents an 1800 percent deviation from the natural abundance ratio. Titanium has five isotopes. The isotope at mass 48 is, naturally, the most abundant. Three of the four minor isotopes produced an isotopic ratio, with respect to the mass 48 isotope, which was equivalent to the natural abundance ratio. However, the mass 49 isotope produced a mass 49 to 48 ratio of 0.42. The natural abundance ratio is 0.075. This represents a deviation from the natural abundance ratio of 560 percent.

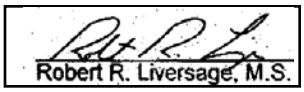
To further-substantiate the validity of the ICP/MS data, a comparison of the quantity of thorium which had been transmuted to the quantity of titanium and copper which had been produced, was performed. The quantitative analysis of the data indicated that the amount of thorium which had undergone transmutation was equivalent to the amount of titanium plus copper which had been formed, within experimental error.

Scintillation counting was performed on the before-processed and after-processed test solutions to verify the ICP/MS results, which indicated that a significant percentage of the thorium placed in the reaction vessel had been transmuted into nonradioactive isotopes. All of the copper and titanium isotopes observed in the after-processed test-solution ICP/MS data are non-radioactive. The scintillation counter used for the analysis was a RM-60 Micro Roentgen Radiation Monitor [from Aware Electronics, New Jersey]. The counter was connected to a Compudyne computer. Equivalent amounts of before-processed and after-processed test solution were

taken to dryness in plastic weighing boats. The scintillation counter was placed-at exactly the same height, directly over the weighing boats, for both tests The residues were then counted for 90 minutes. A relatively long counting time was used to ensure accurate results. The results obtained indicated that a 72 percent reduction of thorium had occurred

After extraction of the processed sample, the reaction vessel was taken apart and all of the pieces of the vessel were individually analyzed by a scintillation counter to ensure that a complete extraction of the thorium had occurred. All of the parts of the vessel produced count rates equivalent to normal background count rates, which indicated that the thorium was completely extracted

My conclusion is that the data generated by both of the analytical techniques used to evaluate The Cincinnati Group's process indicate that significant transmutation of thorium is occurring in their reaction vessel. All of-the data generated from both of the analytical techniques employed produced the anticipated results.



Robert R. Liversage, M.S.
Inorganic Section Manager
Data Chem Laboratories

6/20/97

To Whom it May Concern:

These *[Ed Note: sample vials sent to Cold Fusion Technology, Inc. and to others.]* are the four samples used to generate the third-party verification letter for the Cincinnati Group.

—There are exactly 20.0 ml of solution in each vial for convenient spiking of internal standards, for ICP/MS analysis, to compensate for matrix effects. Suggested internal standard elements: Be for low mass, Ge, Ga, or Sc for middle mass elements, and U for high mass. Beryllium, germanium, and uranium, at around 2 mg/liter in solution, was used for the third-party verification analyses.

—**Vial 1 = REAGENT BLANK** - 5% concentrated nitric acid (Mallinckrodt reagent grade), plus 5% concentrated hydrochloric acid (Mallinckrodt reagent grade) in 18 meg-Ohm de-ionized water. This solution was used for blank subtraction of the mass spectra generated by the sample solutions in vials 2, 3, and 4 described below. This solution was also used to perform the dilutions on the samples contained in vials 2,3, and 4, as described below.

Cell blank stock solution: Two drops of concentrated hydrochloric acid into 600 ml of double distilled water.

Thorium stock solution: two drops of concentrated hydrochloric acid plus approximately (6) grams of thorium nitrate crystals into 600 ml of double-distilled water.

—**VIAL 2 = Cell Blank** - The solution in vial 2 is a 100X dilution of the original processed cell blank solution. Twenty milliliters of cell blank stock solution was placed in the same cell and subjected to the same processing parameters as the processed thorium test sample described below.

—**VIAL 3 = Processed Thorium Test Sample** - The solution in Vial 3 is a 100X dilution of the original processed thorium test sample solution. Twenty milliliters of thorium stock solution were placed in the cell and processed.

—**VIAL 4 = Unprocessed Thorium Test Sample** - the solution in Vial 4 is a 100X dilution of the thorium stock solution.

COMMENTS

1.) After processing the cell blank and thorium test sample, the cell contents were extracted with a 5% nitric acid/5% hydrochloric acid leaching solution. This is the same solution used as the reagent blank, and to dilute the samples contained in vials 2,3, and 4.

2.) The processed cell blank and thorium test sample solutions were taken to an intermediate 10X dilution after extraction from the cell. The final acid concentrations in these intermediate dilutions were 20% nitric acid and 20% hydrochloric acid. These intermediate solutions were not subjected to either a hot plate or microwave digestion. The solutions were diluted to the final 100X working concentration several days after the cells were extracted. Please perform a hot plate or microwave digestion at your discretion. The intermediate solutions were shaken vigorously before extracting the aliquots used to make up working solutions to ensure that representative samples were prepared.

3.) The cell was disassembled after processing and extracting the cell blank and the thorium test sample to ensure quantitative extraction of the contents. After extracting the thorium test sample, all of the parts were measured with a scintillation counter to ensure quantitative extraction of the untransmuted thorium. The count rates generated by all of the parts were at the normal background levels.

4.) All four solutions were analyzed at the 100X dilution by ICP/MS for the third party verification.

5.) We found that thorium "hangs-up" in the ICP/MS sample introduction hardware tenaciously. Consequently, we recommend the samples be analyzed in order, vials 1 through 4, to minimize errors in thorium quantitation due to memory effects.

6.) To determine the amount of thorium transmuted: (Blank subtracted Vial 4 results) minus (Blank subtracted Vial 3 results).

To determine what, and the amounts of transmutation products: (Blank subtracted Vial 3 results) minus (Blank subtracted Vial 2 results)

If you have any additional questions please contact Robert Liversage.

6/24/97

To Whom It May Concern:

These are the four ICP/MS scans used to generate the third-party verification letter for the Cincinnati Group.

SCAN 1 = Reagent Blank - 5% concentrated nitric acid (Mallinckrodt reagent grade), plus 5% concentrated hydrochloric acid (Mallinckrodt reagent grade) in 18 meg-Ohm de-ionized water. This scan was used to blank subtract the mass spectra generated by the sample solutions described below. This solution was used to perform the dilutions on the samples as described below.

Cell blank stock solution: Two drops of concentrated hydrochloric acid into 600 ml of double distilled water.

Thorium stock solution: two drops of concentrated hydrochloric acid plus approximately (6) grams of thorium nitrate crystals into 600 ml of double-distilled water.

—**SCAN 2 = Cell Blank** - Scan 2 was generated from a 100X dilution of the original processed cell blank solution. Twenty milliliters of cell blank stock solution was placed in the same cell and subjected to the same processing parameters as the processed thorium test sample described below.

—SCAN 3 = Processed Thorium Test Sample - Scan 3 was generated from a 100X dilution of the original processed thorium test sample solution. Twenty milliliters of thorium stock solution were placed in the cell and processed.

—SCAN 4 = Unprocessed Thorium Test Sample - Scan 4 was generated from a 100X dilution of the thorium stock solution.

COMMENTS

1.) After processing the cell blank and thorium test sample, the cell contents were extracted with a 5% nitric acid/5% hydrochloric acid leaching solution. This is the same solution used as the reagent blank, and to dilute the samples in order to generate Scans 2,3, and 4.

2.) The processed cell blank and thorium test sample solutions were taken to an intermediate 10X dilution after extraction from the cell.
The final acid concentrations in these intermediate dilutions were 20% nitric acid and 20% hydrochloric acid.
These intermediate solutions were not subjected to either a hot plate or microwave digestion. The solutions were diluted to the final 100X working concentration several days after the cells were extracted. Please perform a hot plate or microwave digestion at your discretion. The intermediate solutions were shaken vigorously before extracting the aliquots used to make up working solutions to ensure that representative samples were prepared.

3.) The cell was disassembled after processing and extracting the cell blank and the thorium test sample to ensure quantitative extraction of the contents. After extracting the thorium test sample, all of the parts were measured with a scintillation counter to ensure quantitative extraction of the untransmuted thorium. The count rates generated by all of the parts were at the normal background levels.

4.) All three sample solutions were analyzed at the 100X dilution by ICP/MS for the third party verification.

5.) To verify thorium reduction:
Compare (Blank subtracted Vial 4 results) against (Blank subtracted Vial 3 results).
To determine what the transmutation products are:
Compare (Blank subtracted Vial 3 results) against (Blank subtracted Vial 2 results)

6. Accurate determination of the amount of thorium transmuted and the amounts of product elements formed is not possible with the information provided. Additional information is required. If you are interested in obtaining a copy of this quantitative analysis of the data, please submit your request to:

Robert Liversage
P.O. Box 1262
Covington, KY 41012-1262

7.) Note: Beryllium, germanium, and uranium were spiked into all four solutions as internal standards for matrix effect compensation. All four solutions were scanned unspiked first to verify that these three metals were not present in the samples.

A *SECOND* Third-Party Verification

Infinite Energy has received from *The Cincinnati Group* news of an additional confirmation. A second third-party verification has been performed by Dr. George Miley of the Unviersity of Illinois, Professor of Nuclear Engineering and head of the Fusion Research Laboratory there.

Dr. Miley witnessed the operation of the reaction cell at his laboratory. The process was performed on an aqueous thorium nitrate solution. The concentration of the test solution and the cell operating parameters were similar to those used to generate the first third-party verification performed by Robert Liversage.

Dr. Miley's laboratory's personnel extracted the sample from the cell for ICP/MS and gamma spectroscopy analysis on equal amounts of processed and unprocessed test solution. The gamma spectroscopy analysis on equal amounts of processed and unprocessed test solution showed a nearly 100% reduction of the thorium. The cell was subsequently broken down into its components for scintillation counting. All parts of the reaction vessel produced count rates equivalent to natural background rates, indicating that thorium had not plated-out on any part of the cell.

Dr. Miley sent the samples to the Waste management and Research Center for ICP/MS analysis. The Analysis was performed by Jonathan Talbot on a Perkin-Elmer/Sciex ICP/MS. The quantitative analysis of thorium performed on the processed and unprocessed throium test solution showed a greater than 97% reduction of thorium in the processed sample—a "total quant" scan was performed on on the processed sample to determine the major transmutation products. A preparation cell (cell blank) was not prepared, consequently, a valid blank subtraction, to discriminate between contaminants (see the *first* third-party verification work for more details) and actual transmutation products could not be performed. However, the significant ion count rates observed at masses 46 through 50 indicate that titanium is a major transmutation product. This observation is consistent with Robert Liversage's third party verification findings. In his evaluation, Mr. Liversage determined titanium and copper to be the major transmutation products.

Key to Understanding ICP/MS Scans on Following Pages

Basic Definition of Column Units:

Mass = Mass/charge ration (M/e): where e = 1 for >99% of the ions emitted from the ICP excitation source under normal operating conditions. Quantitative and qualitative analysis is performed on the singly-charged ions of all elements.
Total Intensity: Units = counts per second (CPS). CPS is proportional to the number of ions impacting the detector per second (IPS). CPS $\propto$ IPS.
Assigned Intensity: Units = CPS (counts per second)

Meaning of Each Column:

Total Intensity = The total CPS that the "Total Quant" software assigns to each naturally occurring singly-charged isotope of each element of each mass. Some more common molecular species are assigned intensities also. The Total Quant program first determines what elements are present in the sample by comparing the total intensities at each mass with a built-in library containing all of the naturally occurring isotopes and their relative abundances. The Total Quant program expects to see signals above background at each mass for which the element to be determined has naturally occurring isotopes, and at relative intensities which are consistent with the relative abundance ratios. This type of qualitative analysis is analogous to gas chromatography/mass spectrometry finger-printing. Once an element is positively identified, the Total Quant software determines how much intensity to assign to each isotope by first "keying in" on the total intensity at the most abundant isotope of each element which is not coincident with (i.e. having the same mass as) isotopes of other elements. (Every element on the periodic table, with the exception of indium[1], has at least one un-interfered-with isotope. The software then determines how much actual intensity to assign to all of the other isotopes of the positively identified elements by multiplying the intensity of the uninterfered with isotope by the natural abundance ratio (i.e. isotope to be determined/uninterfered with isotope).

Ideally, the sum of the assigned intensities at each mass should equal the total intensities, within experimental error. Any left over intensity which could not be assigned to an isotope of an element which occurs at that mass appears after the assigned intensities, at each mass, and is preceded by two question marks. With respect to the transmutation process, it is reasonable to assume that significant unassigned intensities are a result of altered isotopic abundance ratios, as described in Robert Liversage's Third Party Verification letter.

Positive identification of transmutation products was performed by comparing the total intensities at each mass on the cell blank and processed tho-

TOTALQUANT II: COMPREHENSIVE REPORT

Scan #1 Reagent Blank

Data Set: jec_std
Data Set Description:
Parameter File: tq-fscan

Sample ID: sample 18
Sample Description:
Sample Type: **Blank**
Sequence Number: 088
Blank: Not Subtracted
Dilution Factor: 1
Number of Repeats: 1
Time: 10:46:54 May 2 1997
Signal Profile Processing: Average
Spectral Peak Processing: Average
Units: mg/L
Response File: current.rsp

MASS ASSIGNMENTS

Mass	Total Intensity	Assigned Intensities		
4	0			
5	0			
6	0			
7	0			
8	412	?? 412		
9	108140	Be 108140		
10	188	B 177	?? 11	
11	716	B 716		
12	4476	C 4476		
13	96	C 51	CH 9	?? 36
21	204	Ne 1	?? 203	
22	20	Ne 20		
23	19328	Na 19328		
24	1792	Mg 1793	?? -1	
25	356	Mg 231	?? 125	
26	516	Mg 255	CN 3	?? 258
27	3496	Al 3496	CN 1	?? -1
28	22544	Si 22544		
29	11584	Si 1150	COH 447	NNH 9989
		?? -2		
30	3363192	Si 756	COH 6	NO 745425
		NNH 75	?? 2616930	
31	15016	P 15016	COH 1	NO 2769
		?? -2770		
32	2961796	S 2961796	NO 1524	?? -1524
33	8668	S 23695	?? -15027	
34	10568	S 131567	?? -120999	
35	1694916	Cl 1406914	?? 288002	
36	86932	S 1248	Ar 86832	?? -1148
37	455808	Cl 455808		
38	34012	Ar 16233	?? 17779	
42	45984	Ca 148	?? 45836	
43	52	Ca 34	?? 18	
44	476	Ca 476		
45	252	Sc 252		
46	1972	Ca 1	Ti 125	NOO 1847
		?? -1		
47	1128	Ti 115	NOO 7	?? 1006
48	1200	Ca 42	Ti 1159	NOO 8
		?? -9		
49	1036	Ti 87	?? 949	
50	412	Ti 84	V 46	Cr 707
		NAr 19	?? -444	
51	18804	V 18804		
52	13736	Cr 13736		
53	6552	Cr 1567	ArOH 18	?? 4967
54	6340	Cr 391	Fe 364	NAr 5586
		?? -1		
55	616	Mn 596	NAr 21	?? -1
56	5732	Fe 5732		
57	5188	Fe 137	ArOH 5052	?? -1
58	300	Fe 21	Ni 166	?? 113
59	192	Co 182	ArOH 11	?? -1
60	64	Ni 64		
61	40	Ni 3	ScO 2	?? 35
62	28	Ni 9	?? 19	
63	88	Cu 88	ScO 1	?? -1
64	3748	Ni 3	Zn 3746	?? -1
65	3756	Cu 40	?? 3716	
66	2640	Zn 2131	?? 509	
67	1880	Zn 315	?? 1565	
68	1924	Zn 1423	?? 501	
69	568	Ga 568		
70	46760	Zn 48	Ge 46713	?? -1
71	6560	Ga 373	ClAr 1	?? 6186
72	81452	Ge 62443	?? 19009	
73	31244	Ge 17666	?? 13578	
74	126440	Ge 83182	Se 43	?? 43215
75	3748	As 3748	ClAr 1	?? -1
76	33332	Ge 17666	Se 438	ArAr 33
		?? 15195		
77	368	Se 368	ClAr 1	ArArH 2
		?? -3		
78	20	Se 1142	?? -1122	
79	468	Br 468		
80	7164	Se 2419	ArAr 4746	?? -1
81	676	Br 458	ArArH 219	?? -1

Mass	Total Intensity	Assigned Intensities		
82	0	Se 447	?? -447	
83	4	?? 4		
84	8	Sr 3	?? 5	
85	0			
86	152	Sr 42	?? 110	
87	140	Sr 30	?? 110	
88	344	Sr 344		
89	200	Y 200		
90	540	Zr 540		
91	228	Zr 118	?? 110	
92	592	Zr 180	Mo 338	?? 74
93	100	Nb 100		
94	372	Zr 183	Mo 211	?? -22
95	384	Mo 362	?? 22	
96	384	Zr 30	Mo 379	?? -25
97	272	Mo 217	?? 55	
98	548	Mo 548		
99	8	?? 8		
100	256	Mo 219	?? 37	
101	0			
102	8	Pd 1	?? 7	
103	12	Rh 12		
104	4	Pd 4		
105	24	Pd 9	YO 3	?? 12
106	176	Pd 10	?? 166	
107	56	Ag 56	YO 1	?? -1
108	132	Pd 10	?? 122	
109	108	Ag 53	NbO 3	?? 52
110	120	Pd 5	?? 115	
111	40	NbO 1	?? 39	
112	68	Sn 23	?? 45	
113	4	In 28	?? -24	
114	24	Sn 16	?? 8	
115	632	In 625	Sn 9	?? -2
116	332	Sn 340	?? -8	
117	156	Sn 181	?? -25	
118	572	Sn 571	?? 1	
119	436	Sn 204	?? 232	
120	780	Sn 781	?? -1	
121	44	Sb 44		
122	252	Sn 113	?? 139	
123	40	Sb 33	?? 7	
124	120	Sn 142	Xe 1	?? -23
125	0			
126	28	Xe 1	?? 27	
127	456	I 456		
128	0	Xe 2	?? -2	
129	12	Xe 22	?? -10	
130	16	Xe 4	Ba 7	?? 5
131	24	Xe 18	?? 6	
132	28	Xe 22	Ba 7	?? -1
133	0			
134	156	Xe 9	Ba 152	?? -5
135	420	Ba 414	?? 6	
136	596	Xe 8	Ba 491	?? 97
137	956	Ba 711	?? 245	
138	4496	Ba 4496	La 1	?? -1
139	8	La 8		
140	28	?? 28		
141	4	Pr 4		
142	0			
143	0			
144	0			
145	0			
146	4	BaO 1	?? 3	
147	0	BaOH 1	?? -1	
148	4	?? 4		
149	12	?? 12		
150	0	BaO 1	?? -1	
151	4	Eu 5	BaO 1	BaOH 2
		?? -4		
152	12	BaO 1	BaOH 5	?? 6
153	20	Eu 5	BaO 2	BaOH 5
		?? 8		
154	32	BaO 9	BaOH 7	?? 16
155	44	BaOH 44	LaO 1	?? -1
156	184	BaO 1	?? 183	
157	4	BaOH 1	LaO 1	PrO 1
		?? 1		
158	28	?? 28		
159	0	PrO 1	?? -1	
160	0			
161	0			
162	4	?? 4		
163	0			
164	4	?? 4		
165	0			
166	4	?? 4		
167	4	?? 4		
168	0			
169	0			
170	0			
171	0			
172	0			
173	4	?? 4		
174	0			
175	0			
176	0			

TOTALQUANT II: COMPREHENSIVE REPORT

MASS ASSIGNMENTS

Mass	Total Intensity	Assigned Intensities		
177	0			
178	16	?? 16		
179	4	?? 4		
180	4	Ta 1	W 3	
181	100	Ta 100		
182	396	W 387	?? 9	
183	160	W 211	?? -51	
184	448	W 448		
185	0			
186	436	W 419	?? 17	
187	0			
188	0			
189	0			
190	4	?? 4		
191	0			
192	4	?? 4		
193	0			
194	0			
195	0			
196	0	WO 1	?? -1	
197	12	Au 9	TaO 4	?? -1
198	44	WO 2	?? 42	
199	8	TaO 1	WO 1	?? 6
200	60	WO 2	?? 58	
201	0			
202	60	WO 2	?? 58	
203	0			
204	12	Pb 12		
205	20	?? 20		
206	200	Pb 180	?? 20	
207	172	Pb 172		
208	528	Pb 399	?? 129	
209	0			
210	0			
211	0			
212	0			
213	0			
214	0			
215	0			
216	0			
217	4	?? 4		
218	0			
219	0			
220	0			
221	0			
222	0			
223	0			
224	0			
225	0			
226	0			
227	0			
228	0			
229	0			
230	0			
231	0			
232	1896	Th 1896		
233	0			
234	36	U 36		
235	7112	U 4545	?? 2567	
236	0			
237	100	?? 100		
238	1365680	U 627007	?? 738673	
239	28	?? 28		
240	0			
241	0			
242	0			
243	0			
244	4	?? 4		
245	0			

rium test sample mass spectra. The only difference between the cell blank and the processed thorium test samples is the presence of thorium in the test sample. Consequently, intensity contributions at each mass due to contaminants and molecular-doubly-charged interferences should be equivalent, within experimental error, in the two spectra—as explain in Robert Liversage's third party verification. ***Therefore, at masses where significantly greater total intensities were observed in the test sample, relative to the cell blank, the differences were attributed to transmutation products.*** Notice the huge (> a factor of 100 for each four out of five isotopes) difference in the processed test sample intensities versus the cell blank intensities at the titanium isotopes (masses 46 through 50). A significant difference in intensity is also observed at mass 65 (the less naturally abundant isotope of copper).

The second phase of Total Quant processing, in which isotopes are aggregated and optimally fit to a total element distribution (1 through 92), is less useful and reliable for the purposes at hand. The "intensity" column is the summation of the CPS intensities of the constituent isotopes for that element. The "Response" factor is the tabulated factor that the program uses to convert from intensities (CPS) to concentration (in parts per million, ppm) present in the input liquid solution. This response factor has units of CPS/ppm. Finally, the "Concentration" column gives the determined concentration in ppm for the element. —**RL**

1Note on indium: Indium has two isotopes. One is coincident with a minor cadmium isotope. The other is coincident with a minor tin isotope. Qualitative and quantitative analysis of indium probably first involves determining presence or absence of tin and cadmium in the sample. Any unassigned intensities at the masses where the two indium isotopes occur would then be attributed to indium.

Thorium Radioactivity Remediation Data — Third Party Verification

TOTALQUANT II: COMPREHENSIVE REPORT

ANALYTE INTENSITIES

Analyte	Intensity	Response	Concentration
H	NOT MEASURED		
He	0	0.00	
Li	0	1313000.00	0.00000
Be	108140	462300.00	0.23380
B	893	844200.00	0.00106
C	4526	302500.00	0.01495
N	NOT MEASURED		
O	NOT MEASURED		
F	NOT MEASURED		
Ne	227	0.00	
Na	19328	2450000.00	0.00789
Mg	2277	727900.00	0.00313
Al	3496	1370000.00	0.00255
Si	24449	1988000.00	0.01229
P	15015	205700.00	0.07296
S	3117680	65460.00	47.62000
Cl	1862722	3032.00	614.20000
Ar	25766121	0.00	
K	NOT MEASURED		
Ca	23107	2181000.00	0.01059
Sc	252	1825000.00	0.00014
Ti	1567	1411000.00	0.00111
V	18849	1288000.00	0.01462
Cr	16399	1227000.00	0.01336
Mn	595	1469000.00	0.00041
Fe	6254	1217000.00	0.00514
Co	182	941300.00	0.00019
Ni	244	548800.00	0.00044
Cu	127	432700.00	0.00029
Zn	7661	347200.00	0.02205
Ga	940	1036000.00	0.00091
Ge	227644	1074000.00	0.21170
As	3748	209900.00	0.01785
Se	4855	283900.00	0.01710
Br	926	63280.00	0.01463
Kr	0	0.00	
Rb	0	4147000.00	0.00000
Sr	417	4500000.00	0.00009
Y	200	5358000.00	0.00004
Zr	1049	5606000.00	0.00019
Nb	100	4927000.00	0.00002
Mo	2271	4285000.00	0.00053
Ru	0	3823000.00	0.00000
Rh	12	2972000.00	0.00000
Pd	36	2931000.00	0.00001
Ag	108	2604000.00	0.00004
Cd	0	1001000.00	0.00000
In	653	2537000.00	0.00026
Sn	2374	3109000.00	0.00076
Sb	77	2063000.00	0.00004

Te	0	859200.00	0.00000
I	456	5585000.00	0.00008
Xe	81	0.00	
Cs	0	6407000.00	0.00000
Ba	6274	6368000.00	0.00099
La	8	8567000.00	0.00000
Ce	0	9979000.00	0.00000
Pr	4	9765000.00	0.00000
Nd	0	12130000.00	0.00000
Sm	0	15540000.00	0.00000
Eu	8	15610000.00	0.00000
Gd	0	18250000.00	0.00000
Tb	0	20530000.00	0.00000
Dy	0	18210000.00	0.00000
Ho	0	19470000.00	0.00000
Er	0	17850000.00	0.00000
Tm	0	16690000.00	0.00000
Yb	0	14390000.00	0.00000
Lu	0	15240000.00	0.00000
Hf	0	13800000.00	0.00000
Ta	100	11110000.00	0.00001
W	1462	10460000.00	0.00014
Re	0	9796000.00	0.00000
Os	0	12340000.00	0.00000
Ir	0	5489000.00	0.00000
Pt	0	3593000.00	0.00000
Au	8	1436000.00	0.00001
Hg	0	1023000.00	0.00000
Tl	0	2567000.00	0.00000
Pb	761	1304000.00	0.00058
Bi	0	1022000.00	0.00000
Th	1896	753400.00	0.00252
U	631579	805900.00	0.78360

CH	9
COH	453
CN	2
NH	NOT MEASURED
NO	750000
NAr	5629
NNH	10064
NOO	1863
ArOH	5084
ArAr	4784
ArArH	220
ScO	1
YO	3
NbO	3

TOTALQUANT II: COMPREHENSIVE REPORT

Scan #2 Cell Blank

Data Set:	jec_std
Data Set Description:	
Parameter File:	tq-fscan
Sample ID:	sample 8
Sample Description:	
Sample Type:	Sample
Sequence Number:	089
Blank:	Subtracted (088)
Dilution Factor:	1
Number of Repeats:	1
Time:	10:49:18 May 2 1997
Signal Profile Processing:	Average
Spectral Peak Processing:	Average
Units:	ppb
Calibration File:	050297
Response File:	current.rsp

MASS ASSIGNMENTS

Mass	Total Intensity	Assigned Intensities		
4	0			
5	0			
6	0	Li 5	?? -5	
7	60	Li 60		
8	80	?? 80		
9	9164	Be 9164		
10	0			
11	0			
12	0			
13	56	?? 56		
21	164	?? 164		
22	0			
23	15792	Na 15792		
24	13716	Mg 12742	?? 974	
25	1640	Mg 1640		
26	1852	Mg 1809	?? 43	
27	4348	Al 4348		
28	158228	Si 158228		
29	10644	Si 8065	NNH 2580	?? -1
30	506968	Si 5303	NO 501647	NNH 20
		?? -2		
31	3612	P 21	NO 1863	NOH 3592
		?? -1864		
32	501956	S 501956	NO 1026	NOH 14
		?? -1040		
33	2432	S 4016	NOH 8	?? -1592
34	1604	S 22298	?? -20694	

35	192396	Cl 192396		
36	27592	S 212	Ar 27577	?? -197
37	158148	Cl 62332	ArH 33083	?? 62733
38	12988	Ar 5156	?? 7832	
42	29888	Ca 813	?? 29075	
43	184	Ca 184		
44	3864	Ca 2615	?? 1249	
45	2236	Sc 2236		
46	872	Ca 5	Ti 124	NOO 745
		?? -2		
47	232	Ti 114	NOO 3	?? 115
48	1380	Ca 229	Ti 1152	NOO 4
		?? -5		
49	912	Ti 86	?? 826	
50	47348	Ti 84	V 83	Cr 65101
		?? -17920		
51	34292	V 34292	ClO 1	?? -1
52	1265148	Cr 1265148	ArO 1	?? -1
53	829924	Cr 144248	ClO 1	ArOH 83
		?? 685592		
54	494812	Cr 35949	Fe 468667	?? -9804
55	586064	Mn 586064		
56	OVERRANGE	Fe 7381091	ArO 1	
57	OVERRANGE	Fe 176354	ArOH 24390	
58	430624	Fe 26574	Ni 365731	ArO 1
		?? 38318		
59	345196	Co 345147	ArOH 50	?? -1
60	141408	Ni 141408		
61	150320	Ni 6416	ScO 12	?? 143892
62	24580	Ni 19732	?? 4848	
63	37196	Cu 37196	ScO 1	?? -1
64	29292	Ni 5823	Zn 11195	?? 12274
65	18452	Cu 16642	?? 1810	
66	10508	Zn 6368	?? 4140	
67	3240	Zn 942	?? 2298	
68	4252	Zn 4252	Ce++ 1	?? -1
69	1824	Ga 1824	Ce++ 1	?? -1
70	15904	Zn 142	Ge 4175	Ce++ 1
		?? 11586		
71	2904	Ga 1196	ClAr 1	Ce++ 1
		?? 1706		
72	5580	Ge 5580		
73	264	Ge 1579	?? -1315	
74	11448	Ge 7434	?? 4014	
75	272	As 253	ClAr 20	?? -1
76	0	Ge 1579	ArAr 21	?? -1600
77	40	ClAr 7	ArArH 3	?? 30
78	0	ArArHH 1	?? -1	
79	244	Br 244		

MASS ASSIGNMENTS

Mass	Total Intensity	Assigned Intensities		
80	2964	ArAr 2964		
81	556	Br 239	ArArH 318	?? -1
82	8	ArArHH 8		
83	0			
84	40	Sr 5	?? 35	
85	12	Rb 1	?? 11	
86	96	Sr 75	?? 21	
87	12	Rb 1	Sr 53	?? -42
88	620	Sr 620		
89	44	Y 44		
90	484	Zr 484		
91	192	Zr 106	?? 86	
92	18924	Zr 161	Mo 18764	?? -1
93	436	Nb 436		
94	12660	Zr 164	Mo 11696	?? 800
95	22908	Mo 20129	?? 2779	
96	23248	Zr 27	Mo 21090	Ru 3
		?? 2128		
97	14888	Mo 12075	?? 2813	
98	41160	Mo 30509	Ru 1	?? 10650
99	440	Ru 5	?? 435	
100	17020	Mo 12176	Ru 5	?? 4839
101	20	Ru 7	?? 13	
102	12	Ru 12	Pd 2	?? -2
103	0			
104	24	Ru 8	Pd 17	?? -1
105	60	Pd 35	YO 1	?? 24
106	344	Pd 43	Cd 23	ZrO 13
		?? 265		
107	196	Ag 164	YO 1	ZrO 3
		?? 28		
108	392	Pd 42	Cd 16	ZrO 5
		?? 329		
109	152	Ag 152		
110	428	Pd 19	Cd 225	ZrO 5
		?? 179		
111	480	Cd 231	?? 249	
112	436	Cd 436	Sn 81	ZrO 1
		?? -82		
113	376	Cd 223	?? 153	
114	712	Cd 523	Sn 56	?? 133
115	0	Sn 30	?? -30	
116	1548	Cd 138	Sn 1205	?? 205
117	792	Sn 641	?? 151	
118	2024	Sn 2024		
119	996	Sn 723	?? 273	
120	2696	Sn 2767	?? -71	
121	28	Sb 28		
122	312	Sn 398	?? -86	

123	80	Sb 21	?? 59	
124	600	Sn 501	Xe 1	?? 98
125	24	?? 24		
126	0	Xe 1	?? -1	
127	500	I 500		
128	12	Xe 2	?? 10	
129	28	Xe 15	?? 13	
130	56	Xe 3	Ba 19	?? 34
131	12	Xe 12		
132	52	Xe 16	Ba 18	?? 18
133	52	Cs 52		
134	356	Xe 6	Ba 447	?? -97
135	1092	Ba 1216	?? -124	
136	1372	Xe 6	Ba 1441	Ce 1
		?? -76		
137	2180	Ba 2089	?? 91	
138	13220	Ba 13220	La 1	Ce 1
		?? -2		
139	4	La 4		
140	16	Ce 17	?? -1	
141	0			
142	4	Ce 3	?? 1	
143	8	?? 8		
144	0			
145	8	?? 8		
146	8	?? 8		
147	0	BaOH 1	?? -1	
148	0			
149	0			
150	12	?? 12		
151	4	BaOH 2	?? 2	
152	24	BaOH 5	?? 19	
153	0	BaOH 5	?? -5	
154	116	BaOH 7	?? 109	
155	44	BaOH 44	LaO 1	?? -1
156	0			
157	0	BaOH 1	LaO 1	?? -2
158	0			
159	0			
160	0			
161	4	?? 4		
162	0			
163	0			
164	0			
165	4	Ho 4		
166	0			
167	0			
168	0			
169	0			

Thorium Radioactivity Remediation Data — Third Party Verification

MASS ASSIGNMENTS

Mass	Total Intensity	Assigned Intensities		
170	0			
171	0			
172	0			
173	0			
174	0			
175	12	Lu 12		
176	0	Lu 1	?? -1	
177	0			
178	0			
179	0			
180	4	Ta 1	W 3	
181	4	Ta 4	HoO 1	??
182	436	W 388	?? 48	
183	308	W 212	HoO 1	??
184	552	W 450	?? 102	
185	12	Re 3	?? 9	
186	420	W 420		
187	4	Re 4		
188	0			
189	0			
190	0			
191	4	LuO 1	?? 3	
192	0	LuO 1	?? -1	
193	0	LuO 1	?? -1	
194	8	?? 8		
195	0			
196	4	?? 4		
197	64	Au 64	TaO 1	??
198	36	?? 36		
199	20	TaO 1	?? 19	
200	32	?? 32		
201	0			
202	0			
203	4	?? 4		
204	700	Pb 811	?? -111	
205	0			
206	14412	Pb 12924	?? 1488	
207	12080	Pb 12376	?? -296	
208	28640	Pb 28640		
209	32	Bi 32		
210	0			
211	0			
212	0			
213	0			
214	4	?? 4		
215	0			
216	4	?? 4		
217	0			
218	12	?? 12		

219	0		
220	0		
221	0		
222	0		
223	0		
224	0		
225	0		
226	0		
227	0		
228	0		
229	0		
230	0		
231	0		
232	3308	Th 3308	
233	0		
234	8	?? 8	
235	0		
236	0		
237	0		
238	0		
239	0		
240	8	?? 8	
241	0		
242	0		
243	0		
244	0		
245	0		

U = 122575

ANALYTE INTENSITIES

Analyte	Intensity	Response	Concentration
H	NOT MEASURED		
He	0	0.00	
Li	65	1313000.00	0.05
Be	9164	462300.00	19.81
B	0	844200.00	0.00
C	0	302500.00	0.00
N	NOT MEASURED		
O	NOT MEASURED		
F	NOT MEASURED		
Ne	0	0.00	
Na	15792	2450000.00	6.44
Mg	16190	727900.00	22.23
Al	4348	1370000.00	3.17
Si	171595	1988000.00	86.28
P	21	205700.00	0.10
S	528375	65460.00	8071.00
Cl	254728	3032.00	83990.00
Ar	8183026	0.00	
K	NOT MEASURED		
Ca	126897	2181000.00	58.17
Sc	2236	1825000.00	1.22
Ti	1557	1411000.00	1.10
V	34374	1288000.00	26.67
Cr	1510444	1227000.00	1230.00
Mn	586064	1469000.00	398.80
Fe	8052684	1217000.00	6614.00
Co	345146	941300.00	366.60
Ni	539108	548800.00	982.20
Cu	53837	432700.00	124.40
Zn	22897	347200.00	65.93
Ga	3020	1036000.00	2.91
Ge	20343	1074000.00	18.92
As	253	209900.00	1.20
Se	0	283900.00	0.00
Br	483	63280.00	7.63
Kr	0	0.00	
Rb	0	4147000.00	0.00
Sr	751	4500000.00	0.17
Y	44	5358000.00	0.01
Zr	941	5606000.00	0.17
Nb	436	4927000.00	0.09
Mo	126436	4285000.00	29.50
Ru	38	3823000.00	0.01
Rh	0	2972000.00	0.00
Pd	154	2931000.00	0.05
Ag	315	2604000.00	0.12
Cd	1811	1001000.00	1.81
In	0	2537000.00	0.00
Sn	8423	3109000.00	2.71
Sb	49	2063000.00	0.02

Printed 10:50 EDT May 2 1997

Te	0	859200.00	0.00
I	500	5585000.00	0.09
Xe	57	0.00	
Cs	52	6407000.00	0.01
Ba	18448	6368000.00	2.90
La	4	8567000.00	0.00
Ce	18	9979000.00	0.00
Pr	0	9765000.00	0.00
Nd	0	12130000.00	0.00
Sm	0	15540000.00	0.00
Eu	0	15610000.00	0.00
Gd	0	18250000.00	0.00
Tb	0	20530000.00	0.00
Dy	0	18210000.00	0.00
Ho	4	19470000.00	0.00
Er	0	17850000.00	0.00
Tm	0	16690000.00	0.00
Yb	0	14390000.00	0.00
Lu	12	15240000.00	0.00
Hf	0	13800000.00	0.00
Ta	4	11110000.00	0.00
W	1469	10460000.00	0.14
Re	6	9796000.00	0.00
Os	0	12340000.00	0.00
Ir	0	5489000.00	0.00
Pt	0	3593000.00	0.00
Au	64	1436000.00	0.04
Hg	0	1023000.00	0.00
Tl	0	2567000.00	0.00
Pb	54761	1304000.00	41.98
Bi	32	1022000.00	0.03
Th	3308	753400.00	4.39
U	0	805900.00	0.00

NH	NOT MEASURED
NO	504725
NOH	3614
NNH	2599
NOO	751
ClAr	25
ArH	9819631
ArOH	24549
ArAr	2988
ArArH	320
ArArHH	8
ScO	11
YO	1
ZrO	24
BaOH	61

Data Set: jec_std
Data Set Description:
Parameter File: tq-fscan

Sample ID: sample 10
Sample Description:
Sample Type: Sample
Sequence Number: 090
Blank: Subtracted (088)
Dilution Factor: 1
Number of Repeats: 1
Time: 10:51:24 May 2 1997
Signal Profile Processing: Average
Spectral Peak Processing: Average
Units: ppb
Calibration File: 050297
Response File: current.rsp

SCAN #3 THORIUM TE

Scan #3 PROCESSD THORIUM TEST SAMPLE

MASS ASSIGNMENTS

Mass	Total Intensity	Assigned Intensities		
4	4	He 4		
5	0			
6	0	Li 7	?? -7	
7	84	Li 84		
8	76	?? 76		
9	0			
10	0			
11	0			
12	0			
13	56	?? 56		
21	4	?? 4		
22	0			
23	13548	Na 13548		
24	9604	Mg 8173	?? 1431	
25	1052	Mg 1052		
26	1328	Mg 1161	?? 167	
27	2408	Al 2408		
28	221640	Si 221640		
29	14620	Si 11298	NNH 3323	?? -1
30	66516	Si 7428	NO 59065	NNH 25
		?? -2		
31	660	P 4	NO 220	NOH 657
		?? -221		
32	209116	S 209116	NO 121	NOH 3
		?? -124		
33	68	S 1673	NOH 2	?? -1607
34	524	S 9290	?? -8766	

Printed 10:52 EDT May 2 1997

32 = 92152

35	0			
36	0	S 89	?? -89	
37	0			
38	2884	?? 2884		
42	8668	Ca 565	?? 8103	
43	128	Ca 128		
44	4424	Ca 1819	?? 2605	
45	2984	Sc 2984		
46	117720	Ca 3	Ti 155608	?? -37891
47	139440	Ti 142853	?? -3413	
48	1451056	Ca 159	Ti 1450898	?? -1
49	613088	Ti 108121	?? 504967	
50	136936	Ti 104785	V 165	Cr 25542
		?? 6444		
51	68556	V 68556		
52	496376	Cr 496376		
53	316716	Cr 56595	?? 260121	
54	204912	Cr 14105	Fe 220578	?? -29771
55	232568	Mn 232568		
56	3473900	Fe 3473900		
57	2965096	Fe 83001	?? 2882095	
58	181440	Fe 12507	Ni 159889	?? 9044
59	141140	Co 141140		
60	61820	Ni 61820		
61	61616	Ni 2805	ScO 15	?? 58796
62	17384	Ni 8627	?? 8757	
63	28676	Cu 28676	ScO 1	?? -1
64	94888	Ni 2546	?? 92342	
65	108588	Cu 12830	?? 95758	
66	13872	?? 13872		
67	4664	?? 4664		
68	0			
69	96	Ga 96		
70	20088	?? 20088		
71	1392	Ga 63	?? 1329	
72	10172	?? 10172		
73	0			
74	0			
75	0			
76	0			
77	0			
78	0	Kr 1	?? -1	
79	408	Br 408		
80	2076	Kr 2	?? 2074	
81	508	Br 400	?? 108	
82	28	Kr 10	?? 18	
83	60	Kr 10	?? 50	
84	48	Kr 48	Sr 3	?? -3
85	56	?? 56		

Ge = 64089

Thorium Radioactivity Remediation Data — Third Party Verification

Mass	Total Intensity	Assigned Intensities		
86	116	Kr 15	Sr 42	?? 59
87	0	Sr 30	?? -30	
88	348	Sr 348		
89	0			
90	1424	Zr 1412	?? 12	
91	308	Zr 308		
92	4528	Zr 470	Mo 4059	?? -1
93	124	Nb 124		
94	4100	Zr 478	Mo 2530	?? 1092
95	6572	Mo 4355	?? 2217	
96	7520	Zr 77	Mo 4562	?? 2881
97	4512	Mo 2612	?? 1900	
98	11304	Mo 6600	?? 4704	
99	168	?? 168		
100	3548	Mo 2634	?? 914	
101	24	?? 24		
102	20	Pd 1	?? 19	
103	4	Rh 4		
104	8	Pd 8		
105	272	Pd 17	?? 255	
106	1148	Pd 20	Cd 13	ZrO 36
		?? 1079		
107	324	Ag 121	ZrO 8	?? 195
108	492	Pd 20	Cd 9	ZrO 12
		?? 451		
109	112	Ag 112		
110	548	Pd 9	Cd 126	ZrO 12
		?? 401		
111	144	Cd 130	?? 14	
112	244	Cd 244	Sn 12	ZrO 2
		?? -14		
113	160	Cd 125	?? 35	
114	308	Cd 293	Sn 8	?? 7
115	0	Sn 5	?? -5	
116	504	Cd 77	Sn 165	?? 262
117	168	Sn 88	?? 80	
118	276	Sn 276		
119	136	Sn 99	?? 37	
120	248	Sn 378	?? -130	
121	12	Sb 12		
122	0	Sn 55	?? -55	
123	20	Sb 9	?? 11	
124	144	Sn 69	?? 75	
125	0			
126	68	?? 68		
127	700	I 700		
128	12	?? 12		
129	24	?? 24		
130	0			
131	4	?? 4		
132	4	?? 4		
133	28	Cs 28		
134	0			
135	0			
136	0			
137	0			
138	0	La 1	?? -1	
139	20	La 20		
140	0			
141	0			
142	4	?? 4		
143	12	?? 12		
144	0			
145	0			
146	0			
147	0			
148	0			
149	0			
150	8	?? 8		
151	28	?? 28		
152	0			
153	0			
154	20	?? 20		
155	0			
156	0			
157	0			
158	0			
159	0			
160	4	?? 4		
161	0			
162	0			
163	0			
164	0			
165	0			
166	0			
167	0			
168	8	?? 8		
169	20	Tm 20		
170	4	?? 4		
171	0			
172	0			
173	0			
174	0			
175	0			
176	8	?? 8		
177	20	?? 20		
178	4	?? 4		
179	8	?? 8		

MASS ASSIGNMENTS

Mass	Total Intensity	Assigned Intensities	
180	0		
181	0		
182	0		
183	100	?? 100	
184	0		
185	4	TmO 1	?? 3
186	244	?? 244	
187	0	TmO 1	?? -1
188	0		
189	0		
190	0	Pt 1	?? -1
191	0		
192	0	Pt 1	?? -1
193	4	?? 4	
194	4	Pt 4	
195	24	Pt 5	?? 19
196	8	Pt 4	?? 4
197	28	Au 28	
198	0	Pt 1	?? -1
199	36	?? 36	
200	0		
201	4	?? 4	
202	0		
203	16	?? 16	
204	20	Pb 10	?? 10
205	0		
206	204	Pb 152	?? 52
207	188	Pb 146	?? 42
208	336	Pb 336	
209	24	Bi 24	
210	0		
211	0		
212	0		
213	0		
214	0		
215	0		
216	4	?? 4	
217	0		
218	0		
219	0		
220	0		
221	0		
222	0		
223	0		
224	0		
225	0		
226	0		
227	0		
228	0		
229	0		
230	4	?? 4	
231	80	?? 80	
232	475500	Th 475500	
233	20	?? 20	
234	0		
235	0		
236	12	?? 12	
237	0		
238	0		
239	20	?? 20	
240	0		
241	0		
242	0		
243	0		
244	0		
245	4	?? 4	

ANALYTE INTENSITIES

Analyte	Intensity	Response	Concentration
H	NOT MEASURED		
He	4	0.00	
Li	91	1313000.00	0.07
Be	0	462300.00	0.00
B	0	844200.00	0.00
C	0	302500.00	0.00
N	NOT MEASURED		
O	NOT MEASURED		
F	NOT MEASURED		
Ne	0	0.00	
Na	13548	2450000.00	5.53
Mg	10385	727900.00	14.26
Al	2408	1370000.00	1.76
Si	240364	1988000.00	120.80
P	4	205700.00	0.02
S	220122	65460.00	3362.00
Cl	0	3032.00	0.00
Ar	0	0.00	
K	NOT MEASURED		
Ca	88276	2181000.00	40.47
Sc	2984	1825000.00	1.63
Ti	1962263	1411000.00	1390.00
V	68721	1288000.00	53.32
Cr	592617	1227000.00	482.90
Mn	232568	1469000.00	158.20
Fe	3789985	1217000.00	3113.00
Co	141140	941300.00	149.90
Ni	235684	548800.00	429.40
Cu	41505	432700.00	95.91
Zn	0	347200.00	0.00
Ga	159	1036000.00	0.15
Ge	0	1074000.00	0.00
As	0	209900.00	0.00
Se	0	283900.00	0.00
Br	807	63280.00	12.75
Kr	84	0.00	
Rb	0	4147000.00	0.00
Sr	422	4500000.00	0.09
Y	0	5358000.00	0.00
Zr	2743	5606000.00	0.49
Nb	124	4927000.00	0.03
Mo	27350	4285000.00	6.38
Ru	0	3823000.00	0.00
Rh	4	2972000.00	0.00
Pd	73	2931000.00	0.02
Ag	232	2604000.00	0.09
Cd	1014	1001000.00	1.01
In	0	2537000.00	0.00
Sn	1149	3109000.00	0.37
Sb	21	2063000.00	0.01
Te	0	859200.00	0.00
I	700	5585000.00	0.13
Xe	0	0.00	
Cs	28	6407000.00	0.00
Ba	0	6368000.00	0.00
La	20	8567000.00	0.00
Ce	0	9979000.00	0.00
Pr	0	9765000.00	0.00
Nd	0	12130000.00	0.00
Sm	0	15540000.00	0.00
Eu	0	15610000.00	0.00
Gd	0	18250000.00	0.00
Tb	0	20530000.00	0.00
Dy	0	18210000.00	0.00
Ho	0	19470000.00	0.00
Er	0	17850000.00	0.00
Tm	20	16690000.00	0.00
Yb	0	14390000.00	0.00
Lu	0	15240000.00	0.00
Hf	0	13800000.00	0.00
Ta	0	11110000.00	0.00
W	0	10460000.00	0.00
Re	0	9796000.00	0.00
Os	0	12340000.00	0.00
Ir	0	5489000.00	0.00
Pt	12	3593000.00	0.00
Au	28	1436000.00	0.02
Hg	0	1023000.00	0.00
Tl	0	2567000.00	0.00
Pb	642	1304000.00	0.49
Bi	24	1022000.00	0.02
Th	475500	753400.00	631.00
U	0	805900.00	0.00
NH	NOT MEASURED		
NO	59427		
NOH	660		
NNH	3348		
ScO	15		
ZrO	69		

TOTALQUANT II: COMPREHENSIVE REPORT

SCAN # 4 - C
THORIUM TE

Data Set:	jec_std
Data Set Description:	
Parameter File:	tq-fscan
Sample ID:	sample 16
Sample Description:	
Sample Type:	Sample
Sequence Number:	094
Blank:	Subtracted (088)
Dilution Factor:	1
Number of Repeats:	1
Time:	10:59:57 May 2 1997
Signal Profile Processing:	Average
Spectral Peak Processing:	Average
Units:	ppb
Calibration File:	050297
Response File:	current.rsp

Scan #4
UNPROCESSED THORIUM TEST SAMPLE

MASS ASSIGNMENTS

Mass	Total Intensity	Assigned Intensities		
4	0			
5	0			
6	0	Li 3	?? -3	
7	32	Li 32		
8	76	?? 76		
9	0			
10	0			
11	0			
12	0			
13	80	?? 80		
21	112	?? 112		
22	0			
23	0			
24	2300	Mg 2300		
25	340	Mg 297	?? 43	
26	464	Mg 327	?? 137	
27	0			
28	0			
29	0			
30	0			
31	684	NOH 684		
32	520268	S 520269	NOH 3	?? -4
33	4212	S 4163	NOH 2	?? 47
34	992	S 23111	?? -22119	
35	0			
36	0	S 220	?? -220	
37	0			
38	1236	?? 1236		
42	18660	?? 18660		
43	36	?? 36		
44	312	?? 312		
45	92	Sc 92		
46	0			
47	176	?? 176		
48	0			
49	0			
50	0	V 1	NAr 1	?? -2
51	276	V 276		
52	616	?? 616		
53	0			
54	56	Fe 16	NAr 41	?? -1
55	172	Mn 172	NAr 1	?? -1
56	244	Fe 244		
57	452	Fe 6	?? 446	
58	0	Fe 1	?? -1	
59	0			
60	0			
61	8	ScO 1	?? 7	
62	8	?? 8		
63	16	ScO 1	?? 15	
64	0			
65	0			
66	0			
67	0			
68	0			
69	0			
70	22332	Ge 13418	?? 8914	
71	3124	?? 3124		
72	27188	Ge 17936	?? 9252	
73	4636	Ge 5074	?? -438	
74	23892	Ge 23892		
75	0			
76	3360	Ge 5074	?? -1714	
77	0			
78	0			
79	0			
80	5724	?? 5724		
81	0			
82	4	?? 4		
83	0			
84	4	?? 4		
85	8	?? 8		
86	0			
87	0			
88	64	?? 64		
89	0			

MASS ASSIGNMENTS

Mass	Total Intensity	Assigned Intensities	
90	0		
91	0		
92	0		
93	0		
94	0		
95	0		
96	0		
97	0		
98	0		
99	0		
100	0		
101	8	?? 8	
102	0		
103	0		
104	0		
105	0		
106	0		
107	8	?? 8	
108	0		
109	0		
110	0		
111	0		
112	0		
113	8	?? 8	
114	0		
115	0		
116	424	?? 424	
117	0		
118	0		
119	112	?? 112	
120	0		
121	0		
122	0		
123	0		
124	0		
125	0		
126	0		
127	84	I 84	
128	0		
129	20	?? 20	
130	0		
131	8	?? 8	
132	0		
133	0		
134	0		
135	0		
136	0		
137	0		
138	0		
139	0		
140	0		
141	0		
142	12	?? 12	
143	16	?? 16	
144	0		
145	0		
146	8	?? 8	
147	4	?? 4	
148	0		
149	0		
150	0		
151	0		
152	0		
153	0		
154	0		
155	0		
156	0		
157	0		
158	0		
159	0		
160	8	?? 8	
161	0		
162	0		
163	0		
164	0		
165	0		
166	0		
167	0		
168	0		
169	0		
170	0		
171	0		
172	0		
173	0		
174	0		
175	8	Lu 8	
176	0	Lu 1	?? -1
177	0		
178	0		
179	0		
180	0		
181	0		
182	0		
183	0		
184	0		
185	0		
186	0		
187	0		

MASS ASSIGNMENTS

Mass	Total Intensity	Assigned Intensities	
188	0		
189	0		
190	0		
191	0		
192	0		
193	0		
194	0		
195	0		
196	0		
197	16	Au 16	
198	0		
199	4	?? 4	
200	0		
201	0		
202	0		
203	0		
204	0		
205	0		
206	0		
207	0		
208	0		
209	8	Bi 8	
210	0		
211	0		
212	0		
213	0		
214	0		
215	0		
216	0		
217	0		
218	0		
219	0		
220	0		
221	0		
222	0		
223	0		
224	0		
225	0		
226	0		
227	0		
228	0		
229	0		
230	0		
231	92	?? 92	
232	1373696	Th 1373696	
233	60	?? 60	
234	16	?? 16	
235	0		
236	0		
237	0		
238	0		
239	0		
240	0		
241	0		
242	0		
243	0		
244	0		
245	4	?? 4	

ANALYTE INTENSITIES

Analyte	Intensity	Response	Concentration
H	NOT MEASURED		
He	0	0.00	
Li	35	1313000.00	0.03
Be	0	462300.00	0.00
B	0	844200.00	0.00
C	0	302500.00	0.00
N	NOT MEASURED		
O	NOT MEASURED		
F	NOT MEASURED		
Ne	0	0.00	
Na	0	2450000.00	0.00
Mg	2922	727900.00	4.01
Al	0	1370000.00	0.00
Si	0	1988000.00	0.00
P	0	205700.00	0.00
S	547651	65460.00	8365.00
Cl	0	3032.00	0.00
Ar	0	0.00	
K	NOT MEASURED		
Ca	0	2181000.00	0.00
Sc	92	1825000.00	0.05
Ti	0	1411000.00	0.00
V	277	1288000.00	0.21
Cr	0	1227000.00	0.00
Mn	172	1469000.00	0.12
Fe	266	1217000.00	0.22
Co	0	941300.00	0.00
Ni	0	548800.00	0.00
Cu	0	432700.00	0.00
Zn	0	347200.00	0.00
Ga	0	1036000.00	0.00
Ge	65386	1074000.00	60.82
As	0	209900.00	0.00
Se	0	283900.00	0.00
Br	0	63280.00	0.00
Kr	0	0.00	
Rb	0	4147000.00	0.00
Sr	0	4500000.00	0.00
Y	0	5358000.00	0.00
Zr	0	5606000.00	0.00
Nb	0	4927000.00	0.00
Mo	0	4285000.00	0.00
Ru	0	3823000.00	0.00
Rh	0	2972000.00	0.00
Pd	0	2931000.00	0.00
Ag	0	2604000.00	0.00
Cd	0	1001000.00	0.00
In	0	2537000.00	0.00
Sn	0	3109000.00	0.00
Sb	0	2063000.00	0.00
Te	0	859200.00	0.00
I	84	5585000.00	0.02
Xe	0	0.00	
Cs	0	6407000.00	0.00
Ba	0	6368000.00	0.00
La	0	8567000.00	0.00
Ce	0	9979000.00	0.00
Pr	0	9765000.00	0.00
Nd	0	12130000.00	0.00
Sm	0	15540000.00	0.00
Eu	0	15610000.00	0.00
Gd	0	18250000.00	0.00
Tb	0	20530000.00	0.00
Dy	0	18210000.00	0.00
Ho	0	19470000.00	0.00
Er	0	17850000.00	0.00
Tm	0	16690000.00	0.00
Yb	0	14390000.00	0.00
Lu	8	15240000.00	0.00
Hf	0	13800000.00	0.00
Ta	0	11110000.00	0.00
W	0	10460000.00	0.00
Re	0	9796000.00	0.00
Os	0	12340000.00	0.00
Ir	0	5489000.00	0.00
Pt	0	3593000.00	0.00
Au	16	1436000.00	0.01
Hg	0	1023000.00	0.00
Tl	0	2567000.00	0.00
Pb	0	1304000.00	0.00
Bi	8	1022000.00	0.01
Th	1373696	753400.00	1823.00
U	0	805900.00	0.00
NH	NOT MEASURED		
NOH	688		
NAr	41		

Thorium Radioactivity Remediation Data — Third Party Verification

Commercial Lab Analysis of Macroscopic Flake from Cincinnati Group Transmutation Cell

DATA CHEM LABORATORIES

CINCINNATI OFFICE:
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Cincinnati, Ohio 45242-3706
513-733-5336 Fax: 513-733-5347

4/23/97

SUBMITTED TO:
Stan Gleeson
HOLLOMAN AND ASSOCIATES
9772 PRINCETON GLENDALE RD., SUITE 25
CINCINNATI, OH 45246

REFERENCE DATA

Client Sample Nos.: PS and CS
P.O. Number: Not available
Sample Location: Not available
Sample type: Bulk
Method Reference: Particle Characterization by TEM
DCL Set ID No.: 97-T-2060
DCL Sample ID Nos.: 97-13491 and 97-13492
Preparation Date: 4/13/97 Analysis Date: 4/13-14/97

We certify that the samples indicated on the following data sheets were analyzed by Transmission Electron Microscopy (TEM) to characterize he amounts and types of materials present. Samples were prepared by direct mounting of the tweezer-picked particles onto a TEM grid by means of an adhesive agent (ink correction fluid). Analysis was performed on a Phillips CM-12 TEM with energy dispersive X-ray analysis (EDXA) capabilities. Particle Morphologies, selected area electron diffraction (SAED) patterns and EDXA spectra were used to determine particle types (when applicable). Results apply only to portions of samples analyzed and are tabulated on the following data sheet(s). DataChem Laboratories will dispose of bulk samples after 60 days unless other arrangements are made.

DataChem Laboratories
TEM Bulk Asbestos Analytical Report
DCL Sample Set ID: 97-T-2060
Client: Cincinnati Group
Sample Location: Not Available

ANALYSIS DATA
Calibration Date: 1/10/97
EDXA Resolution: 164.9 keV
Accelerating Voltage: 100 keV

Magnification: 9,900 X
Calibration constant: 1 cm = 1.01 μm
Camera Constant: 33.6 mm-Å

Sample Preparation:

A tiny drop of an ink correction fluid was placed near the center of a TEM grid. A few flakey particles with reddish yellow color picked up from the sample boat with tweezers were deposited onto the edges of the solidifying correction fluid. The correction fluid was left to solidify completely for about 5 minutes.

Transmission Electron Microscope grid on which the copper-containing flake (dark piece in center) is mounted on solidified correction fluid (large gray area). *Photo courtesy: Cincinnati Group*

General Description of Material Observed on Grid:

The sizes of the particles observed range from about 4-5 micron to more than 100 μm in longest dimension. A few large particles appear to be holding on the edge of the correction fluid. The correction fluid material was distinguished from the deposited particles by its appearance of a viscous fluid containing very small particles smeared onto the grid. In addition, the image contrast for deposited particles from the sample material under analysis is much higher than the fluid correction material.

Several EDXA spectra obtained from various sample portions are attached. The sample portions that produced the spectra and features noted on the spectra are described below:

EDXA Spectra No. 1 and 2 are from the thin edge of a particle where several cubic and tetragonal crystals embedded in a matrix of polycrystalline material (grain size of <0.2-0.3 microns). Both of these spectra were obtained by focusing the beam in an area of interlocking crystals and thus should represent the compositional makeup of the crystals. However, it is more than likely that the matrix has contributed to the spectra. The dominant elements in these spectra (based on peak height) are Cu, Fe, Ni, Cr, Ti, and lesser amounts of Si, Th, K, V, and S.

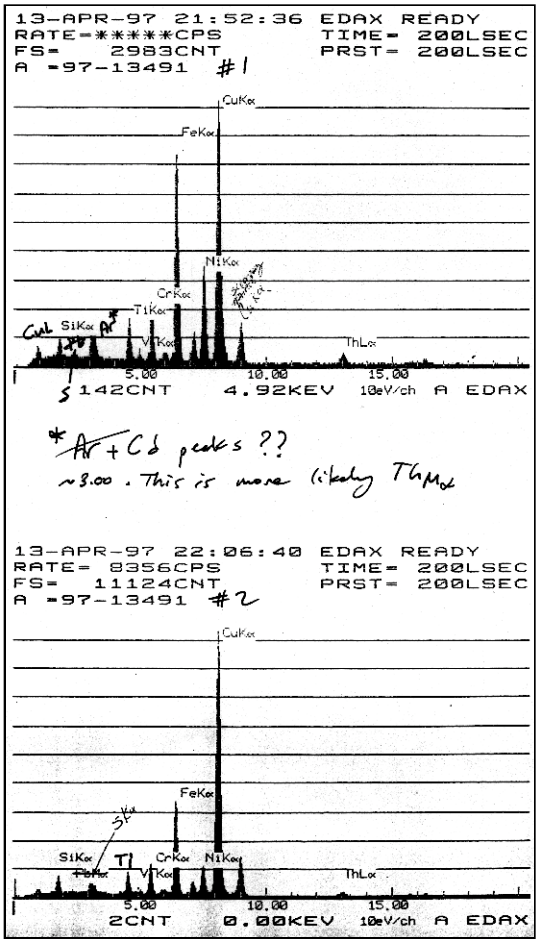
EDXA Spectra No. 3 and 4 were obtained with the hope of amplifying the differences in composition between the matrix and the embedded crystals described in spectra No 1 and 2. No. 3 is from a large crystal-free region of what is termed herein as matrix, and No. 4 is obtained with the beam focused directly on a crystal. A comparison of No. 3 and No. 4 Spectra shows differences in the relative peak heights where all peaks but Fe appear to be smaller in intensity. Although all of these four spectra were obtained in sample areas very similar to the one another and thought to have the same general composition, a major change in composition appears to occur in that Cu, the most dominant peak in Spectra No. 1 and 2, is replaced by Fe in Spectra No. 3 and 4 as the most dominant peak. This indicates the compositional variability within the sample, even in areas of apparent textural homogeneity .

EDXA spectra No. 5 and 6 were obtained to show that the Cu peaks in the spectra are not just an artifact of using a Cu grid. After 25 seconds of collection time, a grid area with no apparent particles in it produces a Cu peak with a 147 counts (147 CNT, recorded at the lower left corner of the spectrum). When the spectrum is collected from a particle with a flaky shape and other features very similar to what has been termed as matrix (only at a few microns away from where the Spectrum #5 was obtained), the spectrum shows a Cu peak with 1594 counts. This difference of approximately ten fold in the X-ray count is, in our opinion, a compelling indication that Cu is present in the particle analyzed.

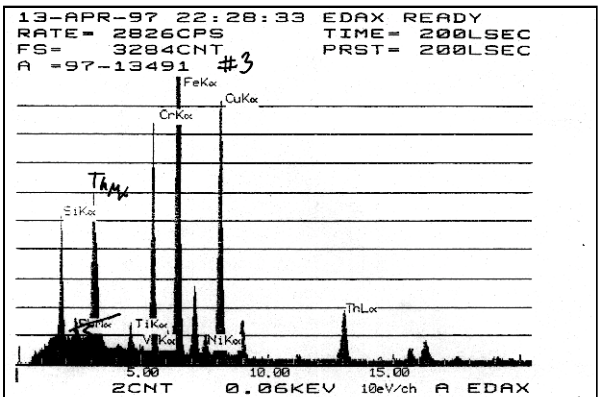
Conclusion:

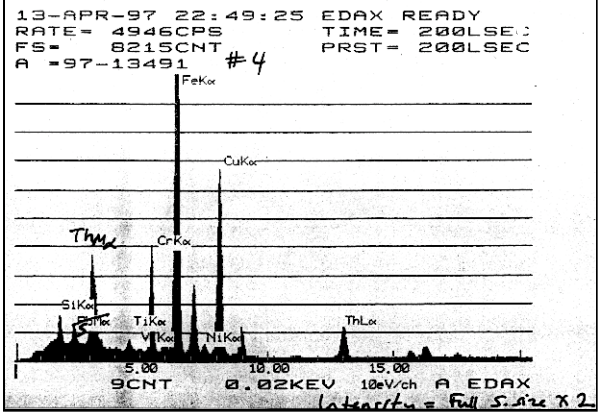
The bulk of material retained on the grid is composed of a "matrix," which appears to be a very fine-grained, polycrystalline substance. Based on the elemental peak heights, this material appears to be composed predominantly of Fe, Cu and Cr with minor Si, Th, Ti, Ni, and S, although relative peak heights are variable. The crystals that are observed embedded in the matrix also have a variable composition similar to the "matrix" in all the elements they contain. However, there appears to be more Fe in the crystals than there is in the matrix. There also are lesser differences in the amounts of the minor elements present. A few smaller, leaf-like particles have a very similar texture to the matrix material when examined at higher magnification. These showed higher Cu peaks than the Fe peaks and may indicate a higher Cu content than Fe in the smaller flakes.

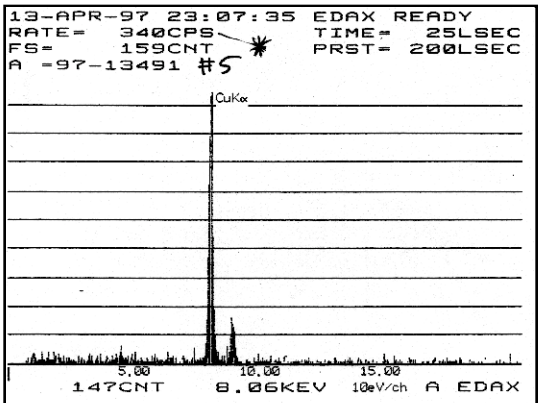
(signed) Kenan Cetin Analyst
(signed) Anna Marie Ristich Section Manager

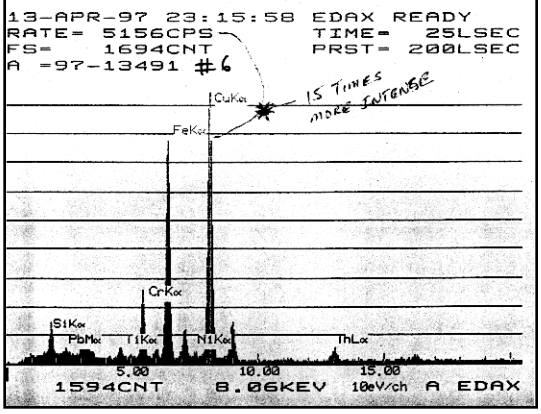

13-APR-97 21:52:36 EDAX READY
RATE=*****CPS TIME= 200LSEC
FS= 2983CNT PRST= 200LSEC
A =97-13491 #1
CuKα
FeKα
NiKα
CrKα
TiKα
VKα
ThLα
5.00
10.00
15.00
5142CNT 4.92KEV 10eV/ch A EDAX
*Ar+Cd peaks ??
~3.00. This is more likely ThMα

13-APR-97 22:06:40 EDAX READY
RATE= 8356CPS TIME= 200LSEC
FS= 11124CNT PRST= 200LSEC
A =97-13491 #2
CuKα
FeKα
SiKα
TiKα
CrKα
NiKα
VKα
ThLα
5.00
10.00
15.00
2CNT 0.00KEV 10eV/ch A EDAX


13-APR-97 22:28:33 EDAX READY
RATE= 2826CPS TIME= 200LSEC
FS= 3284CNT PRST= 200LSEC
A =97-13491 #3
FeKα
CuKα
CrKα
ThMα
SiKα
TiKα
VKα
NiKα
ThLα
5.00
10.00
15.00
2CNT 0.06KEV 10eV/ch A EDAX
Intensity = Full S. Size x 2


13-APR-97 22:49:25 EDAX READY
RATE= 4946CPS TIME= 200LSEC
FS= 8215CNT PRST= 200LSEC
A =97-13491 #4
FeKα
CuKα
ThMα
CrKα
SiKα
TiKα
VKα
NiKα
ThLα
5.00
10.00
15.00
9CNT 0.02KEV 10eV/ch A EDAX
Intensity = Full S. Size x 2


13-APR-97 23:07:35 EDAX READY
RATE= 340CPS TIME= 25LSEC
FS= 159CNT PRST= 200LSEC
A =97-13491 #5
CuKα
5.00
10.00
15.00
147CNT 8.06KEV 10eV/ch A EDAX


13-APR-97 23:15:58 EDAX READY
RATE= 5156CPS TIME= 25LSEC
FS= 1694CNT PRST= 200LSEC
A =97-13491 #6
CuKα
15 TIMES MORE INTENSE
FeKα
CrKα
SiKα
PbMα
TiKα
NiKα
ThLα
5.00
10.00
15.00
1594CNT 8.06KEV 10eV/ch A EDAX