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Research Article

Anomalous Metals in Electrified Vacuum

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Abstract

Independent analysis of Quantum Rabbit (QR) vacuum arc test samples from an experiment conducted on Sept. 27, 2011 revealed the anomalous appearance of potassium (K) and gold (Au). These anomalies appeared in a prior QR vacuum arc test and raise the possibility of low energy transmutation.
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1. Background

The 2011 experiment followed a test conducted at the Quantum Rabbit (QR) lab on July 30, 2009. In 2009, researchers performed a vacuum discharge test utilizing a copper anode—into which a pure lead insert had been pressed—a copper cathode, and pure lithium and sulfur test material. The tube was pumped down to vacuum, and pure oxygen admitted to approximately 3.5 torr. An electric arc was struck and a glow discharge with the characteristic color of lithium was produced. Analysis of test samples by Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP) revealed the anomalous presence of germanium (Ge) at 3196 parts per million (ppm); potassium (K) at 750 ppm; and gold (Au) at 174 ppm [1].

2. Vacuum Tube Design

The 2009 experiment utilized the special vacuum tube designed by me and employed in previous metal vapor tests. The borosilicate glass tube was 150 mm long, with a 50 mm quartz midsection. A 3/8-inch diameter quartz straight section, perpendicular to the tube and 75 mm in length, connected the midsection with the vacuum manifold, and served as the entrance for a pure oxygen backfill. The 2011 test employed a vacuum tube with a different design. The 2011 tube was made entirely of quartz and fastened vertically atop the vacuum manifold. This eliminated the perpendicular joint that connected the 2009 tube with the manifold, thus reducing the possibility of breakage. The 2011 test employed the same inputs as the 2009 experiment, with several new features.

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Figure 1. Sulfur and lithium atop the anode recess.

2.1. Anode recess

The first modification was the creation of a small recess at the center of the anode. The recess facilitated a more secure placement of test material in the tube. The recess helped confine the test material to the reaction zone. As was the case in 2009, a lead insert was placed in the center of the copper anode. The lead insert consisted of a lead slug approximately 0.25-inch diameter pressed into a 0.25-inch by 0.25-inch drilled hole. One piece of lithium was centrally placed atop the lead insert. The lithium was surrounded by sulfur pieces (Fig. 1).

Electrode (copper anode and cathode) separation was adjusted to a minimum value with just enough clearance to reduce shorting. Typically this was in the range of 0.30–0.60 inch.

2.2. Neon fill gas

The second modification was the use of neon as a fill gas to strike plasma before admitting oxygen as the catalyst. Oxygen was the sole fill gas in the 2009 test.

3. Experiment Timeline

The test proceeded in real time as follows (keep in mind that the data points are approximate.) The tube was pumped down to vacuum. Neon was admitted at the start to 2 torr. At 1 min in, the torr reading was 3.0, while power supply readings measured 53 V and 6.95 A. The inside of the tube was glowing red-purple, with what appeared to be the color of neon plasma. At about 2 min, the readings were as follows: 3.0 torr, 70 V, and 5.63 A. Intense heat was generated at this point; so that the test materials appeared to be melting. Oxygen was admitted between minute 3 and 4, and the torr reading went up to approximately 8.28. Following the oxygen fill, the test material began glowing a ruby red, the characteristic color of lithium plasma. At around 6 min, there was concern that the tube had failed. Power was disconnected. Thirty seconds later it was decided that the tube was still viable, and the decision was made to admit fresh oxygen and fire up the tube once again. At this point the tube began glowing blue–green (Fig. 2).

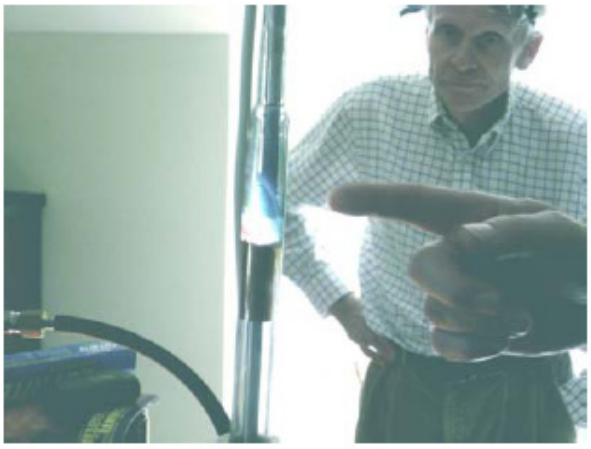

Figure 2. Blue–green discharge in vacuum tube.

Between 8 and 9 min, the power alternated between 45–55 V and 6.65 and 7.5 A. After 10 min, conditions in the tube appeared to stabilize. Voltage hovered around 77 and amps around 5.4. The test finished after a total time of approximately 14 min with a 3.5 torr reading. Upon conclusion of the experiment, the electricity was turned off, the vacuum pumps disconnected, and the samples allowed to cool.

4. Results

Two sets of samples were retrieved for testing: (1) the lead-tipped copper anode with lithium–sulfur residue in its center and (2) the copper cathode and the quartz tube which contained residue on the inner surface. The anode, cathode, and inside of the tube had undergone noticeable changes during the experiment. The samples were carefully packaged and sent to New Hampshire Materials Laboratory for ICP analysis. The 2011 result paralleled the result of 2009. Two of the three anomalous metals that appeared in 2009 were detected in 2011: potassium (K) at 181 ppm and gold (Au) at 252 ppm [2]. A comparison between the 2009 and 2011 experiments is shown in Table 1 (values in parts per million.)

Table 1. Comparison of 2011 and 2009 experiments.

Element	Starting concentration*	Final concentration**
2011		
Au	< 0.51	252
K	< 1.615	181
2009		
Au	< 0.5	174
K	36.610	750

*Certificates of analysis of test components provided by Alfa Aesar; additional values for K provided by M & M Glassblowing.

**ICP Analysis by New Hampshire Materials Laboratory.

5. Conclusions

The 2011 results raise the question that was raised in 2009, namely, where did the anomalous metals come from? There are three possible sources for the anomalies: (1) contamination, or the presence of anomalies in test materials prior to experiment; (2) concentration, or the gathering of anomalous elements in the tested region and (3) transmutation, or the formation of anomalies through low energy nuclear reactions. The third possibility, that the anomalies appeared through a process of low energy transmutation, is not accepted by modern science. Placing the lithium-sulfur test material in contact with the lead anode, pumping down to vacuum, admitting oxygen as a catalyst and electrifying the tube, may have caused the lithium nuclei to fuse with sulfur nuclei, and produce nuclei of potassium (K). As fusion took place, a fission reaction occurred in which the lead (Pb) anode split into lithium and gold (Au). In other words, the process of low energy fusion, in which lithium and sulfur fuse to form potassium, initiates a process of low energy fission, in which nuclei of lithium are subtracted from nuclei of lead, thus forming gold:

$$^{7}\mathrm{Li} + {}^{32}\mathrm{S} \rightarrow {}^{39}\mathrm{K} \ \ \text{(fusion reaction)},$$

$$^{204}\mathrm{Pb} \rightarrow {}^{7}\mathrm{Li} + {}^{197}\mathrm{Au} \ \ \text{(fission reaction)}.$$

Based on many studies, an electric arc apparently has the ability to cause transmutation resulting in an increase in mass of the target. Consequently, the observations reported above are important and contribute more support to this phenomenon.

However, it is premature to speculate as to how and why this process occurs. The enormous Coulomb barrier is not trivial and cannot be waved away by trivial explanations.

According to the standard model, the reaction Pb → Li + Au is endothermic, hence impossible. The reaction $\mathrm{Li} + \mathrm{S} \rightarrow \mathrm{K}$, although it is exothermic, it would produce radioactive isotopes if it actually occurred. These radioactive isotopes need to be acknowledged and sought. Clearly additional research is required to test the hypothesis of low energy transmutation as postulated in the above paper.

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[1] New Hampshire Materials Laboratory, Test Report, file number 26657, August 14, 2009.
[2] New Hampshire Materials Laboratory, Test Repor*t*, file number 28929, October 14, 2011.