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Lawrenceville Plasma Physics, Inc

High technology research, development and consulting in plasma physics, X-ray sources, and Focus Fusion

LPP Focus Fusion Report
August 27, 2015

Summary:

- **LPPFusion Completes Current $2 Million Stock Offering**
- **Oxides Removed From Tungsten Electrodes**
- **Dr. Syed Hassan Joins Research Team**
- **CFO Robert Fitzgerald On Medical Leave**
- **New Videos Released On Lab Work, Cosmology**

LPPFusion Completes Fourth Stock Offering

In late August, LPPFusion sold the last shares from its fourth stock offering, completing the raising of $2 million in capital. The share offering was initiated in June, 2011 when 20,000 shares were offered at $100 a share. During the four years of this offering, LPPFusion also sold out a fifth special offering for $250,000, and raised $180,000 through its Indiegogo crowdfunding effort. Over these years, the rate of funding has increased, with total funds raised per year doubling for the period since January 2014 as compared with the prior period. LPPFusion credits this increase to the added visibility of our work due to the release of an independent review of our work, our greatly improved website, and the publicity generated in association with the crowdfunding.

“We want to give our sincere thanks to our more than 80 investors for the confidence they have placed in our project to develop a clean, safe and economical source of energy,” said LPPFusion President and Chief Scientist Eric Lerner.

The LPPFusion Board of Advisors will soon decide on the terms of a new stock offering to fund the company on an expanded scale in the coming years. In accordance with US SEC regulations, shares will only be available to US citizens and to those living in the US who qualify as “accredited investors”, and will be available to all others in accordance with regulations in their countries.

Oxides Removed From Tungsten Electrodes

As the research team had suspected, an oxide coating on the tungsten electrodes prevented the achievement in the first shots in June of the very low impurity levels needed for increased fusion yield. This oxide coating has now been substantially reduced or eliminated and the electrodes are ready for a new round of experiments.

When the team opened up the vacuum chamber to inspect the electrodes in mid-July, they immediately noticed a widespread coating of a gold-colored material, mixed with a purple color. (see Figure 1) Research Associate Clifton Whittaker rapidly found in the literature that this material was tungsten bronze, a compound of tungsten, oxygen and hydrogen. X-ray analysis of the coating on a steel plate confirmed that it was mostly tungsten. The bronze formed when a layer of tungsten oxide on the electrodes reacted with the deuterium fill gas. Deuterium is an isotope of hydrogen, with an extra neutron in the nucleus, but it is chemically identical to ordinary hydrogen. The reaction occurs at only 400 C and causes the release of tungsten to the plasma. In contrast, metallic tungsten does not react with hydrogen and must be vaporized at 5500 C to enter the plasma.

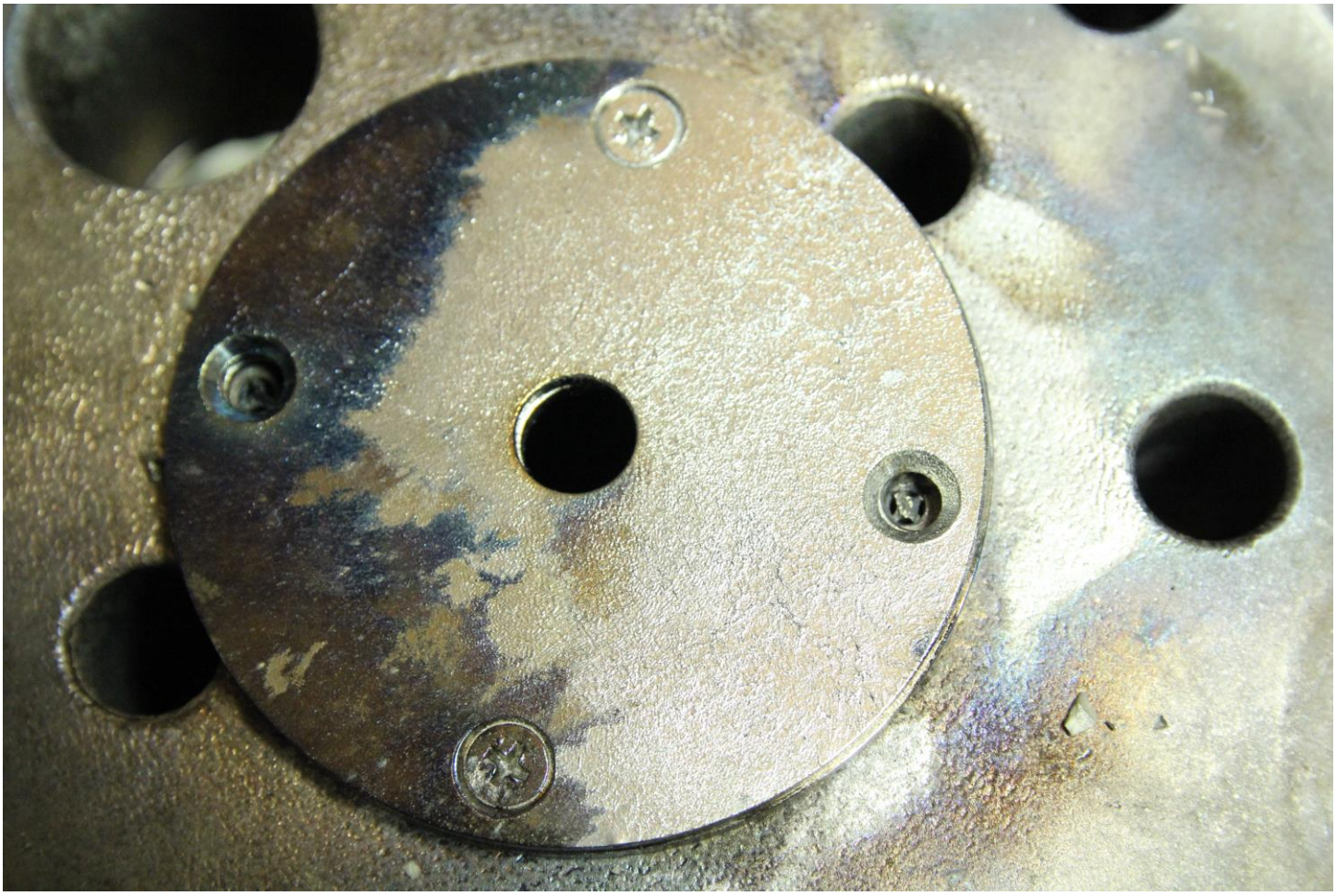

Figure 1. *Tungsten bronze deposits are seen here on the steel plate at the bottom of the vacuum chamber. The small central hole leads to the drift tube, where the ions beam is measured.*

After consultation with the electrode manufacturer and further literature search, the team learned that tungsten oxide forms at high temperature in two separate layers—one thick and easily removed and the other a few microns thick, tightly bound and basically invisible. While we had carefully removed the outer layer, the second layer remained and created the tungsten bronze—and the tungsten impurities in the plasmas.

The tungsten oxide was also a possible cause of the breakage of the ceramic insulator that separates the anode and cathode. This suffered a puncture after only a dozen shots. This appears to have been due to a particle of tungsten oxide on the insulator suddenly reacting with the deuterium, releasing tungsten and concentrating the electric field to a level that could break down the insulator.

A second problem was uncovered by our inspection. The electron beam generated by the plasmoids was heavily vaporizing the end of the hole at the tip of the anode. Vaporized material—mostly tungsten oxide again—hit the bottom of the of the vacuum chamber and bounced off, blowing back material onto the anode and cathode. This material added to the irregular distributed impurities entering the plasma, further interfering with a strong, symmetrical compression.

We've taken a number of steps to solve the problems we found. First, Whittaker carefully diamond polished by hand the entire anode and cathode surface to remove the oxides and minor roughness caused when the insulator broke. We're confident that removed the oxides from the anode, but with the cathode's complex surface the research team decided, through consultation with chemists, to put the cathode in a six-hour long ammonia bath at 80 C (which we had to do outdoors!). This chemical reaction should have removed the last of the oxides for the cathode. (see Figure 2)

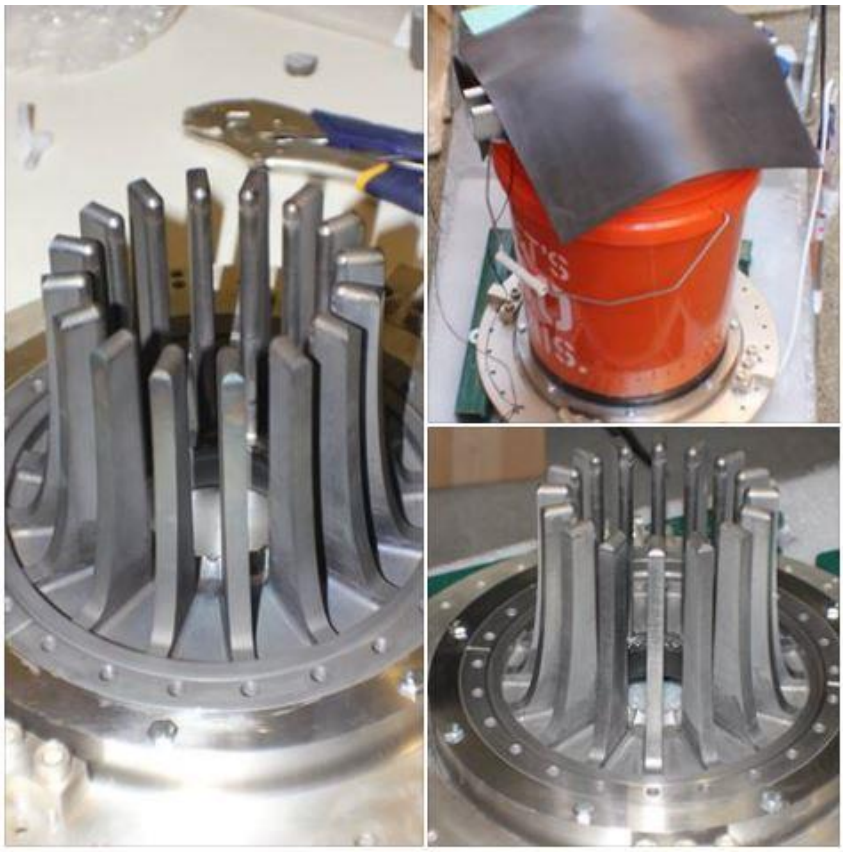

Figure 2 - *Oxides that gave the cathode(left) a dull coating, were removed in a six-hour long outdoors ammonia bath(top right), leaving a clean and brighter cathode(bottom right).*

We replaced the insulator with a new one, and ordered two more of higher purity 99.9% alumina, which increases by 50% their resistance to breakdown. In addition, we are going to closely observe the insulator and electrodes with a long distance magnifier and we will test the insulator for intactness electrically before each shot.

To reduce the blow-back, we have widened the hole at the bottom of the chamber that leads to the meter-long drift tube, so that any reaming debris will travel far from the electrodes. In addition, we are working out theoretically ways to transfer more of the energy from the electron beam to the heating of plasmoid, leaving less available to damage the anode. This work involves mixing in heavier gases and is still under way. We'll report more on it next month. Reassembly of the cleaned electrodes is now almost complete, so we expect new experiments in early September.

Dr. Syed Hassan Joins LPPFusion Research Team

Dr. Syed Hassan, a plasma physicist with more than 18 years of experience with the dense plasma focus device has joined LPPFusion's research team as a Research Physicist. Dr. Hassan received his PhD. from Nanyang Technological University in Singapore, where he also designed the medium-size DPF for the Imperial College London. From 2007 to 2010, as a Marie Curie Fellow and HiPER fellow, he performed experiments with plasma focus and X-pinch devices he had constructed for the Technological Educational Institute of Crete, Greece. Dr. Hassan has also an extensive experience in laser produced plasma generation and interaction of radiation with matter at extreme conditions. Most recently he was a Research Associate at the School of Nuclear Engineering, Purdue University. He has both designed plasma focus devices and has innovated diagnostic instruments for the device. We welcome Dr. Hassan and look forward to his contributions to the experimental work.

Dr. Syed Hassan- Research Physicist

CFO Robert Fitzgerald On Medical Leave

LPP CFO Robert Fitzgerald is unfortunately ill and is on an extended medical leave. Out of respect for Bob's privacy we can't provide further information. We all wish Bob a speedy and complete recovery. In the interim,

former CFO Aaron Blake is filling in as Secretary-Treasurer and CIO Ivan Karamitsos is supervising day-to-day finances with the help of Administrative Assistant John Harhai.

New Videos Released On Lab Work, Cosmology

New videos of the repair and assembly of the tungsten cathode and of the firing of the first shots with the tungsten electrodes are now available. LPPFusion is also releasing a video of Lerner's presentation on evidence against the concordance cosmology theory presented to the EWASS 2015 conference in July.