Accident Report

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On January 24, 2005 at around 4:00 p.m. an explosion occurred during a plasma electrolysis experiment being performed by Mizuno in the Quantum Energy Engineering Section.

The cell was a 1000 cc Pyrex glass vessel which has been in use for about 5 years. It contained 700 cc of 0.2M K_2CO_3 electrolyte; a platinum mesh anode; and a tungsten cathode wire 1.5 mm in diameter, 29 cm long, with 3 cm exposed to the electrolyte. Electrolyte temperature was 20 deg C. The cell was placed inside a constant temperature air-cooled incubator (Yamato 1L-6) with the outer door open, and the inner Plexiglas safety door closed. The experimental setup is described in Ref. 1 and cells are shown in Fig. 1 and 2. The event occurred in the early stage of the experiment before a plasma normally forms. Soon after ordinary electrolysis began, voltage was increased to 20 V and current to 1.5 A. 5 or 6 seconds later, a bright white flash was seen on the lower portion of the cathode. The light expanded and at the same instant the cell exploded.

The explosion blew open the Plexiglas safety door and spread shards of Pyrex glass and electrolyte up to 5 ~ 6 m into the surrounding area.

When the explosion occurred, Mizuno and a guest visiting the laboratory (who wishes to remain anonymous) were observing the cell about 1 m from the incubator. They were wounded in the face, neck, arms and chest by shards of glass 1 ~ 5 cm long. Fortunately, there were no injuries to their eyes. The injuries are light, and they are expected to recover in a week. However, the explosion made such a tremendous noise both victims were temporarily rendered completely deaf. It is not known whether this will have any after-effects.

Possible Causes

The vessel was old and may have had a scratch on the inner surface.

The effluent hydrogen and oxygen were mixed in the cell headspace. There 2 ~ 3 cc of hydrogen at the time, although this is an open cell so only minimal amounts of gas remain in the headspace.

It is possible that the tungsten cathode may have been exposed to the gas in the headspace.

Recommendations

Researchers performing similar glow discharge experiments are advised to make an experimental setup that can undergo an explosion without endangering personnel. Care should be taken not only to protect against shards and fragments, but also to avoid exposure to the extreme noise of an explosion.

Voltage, current and electrolyte temperature were below the levels needed to form a glow discharge, so it is unclear what might have caused the explosion.

Countermeasures

Here are some basic protective steps that should be taken in all experiments of this nature:

Perform experiments under remote control, with power supplies and meters placed a safe distance from the cell.

Use an explosion-proof cell vessel and equipment chamber.

Do not use glass cells. (We are now investigating alternative materials.)

All glass and plastic vessels should be wrapped with filament tape to prevent fragmentation.

Prevent mixing and recombination of effluent hydrogen and oxygen. However, it would be impossible to prevent mixing during the glow discharge phase when both gasses are generated at the cathode.

Use nontoxic or reduced toxicity electrolyte solutions.

Always use safety glasses, helmets, faceguards and an acrylic blast screen.

While we have not concluded this incident was caused by a cold fusion reaction, be aware that cold fusion is still poorly understood and difficult to control.

Be aware that in normal operation these systems often produce intense ultra-violet rays that can damage unprotected eyes; and they can produce intense magnetic fields and possibly x-rays and neutrons. Take steps to protect yourself from these as well.

References

1. Mizuno, T., T. Ohmori, and T. Akimoto. *Generation of Heat and Products During Plasma Electrolysis*. in *Tenth International Conference on Cold Fusion*. 2003. Cambridge, MA: LENR-CANR.org. http://lenr-canr.org/acrobat/MizunoTgeneration.pdf

Figure 1. A glow discharge cell. Photo taken in 2003 by T. Mizuno

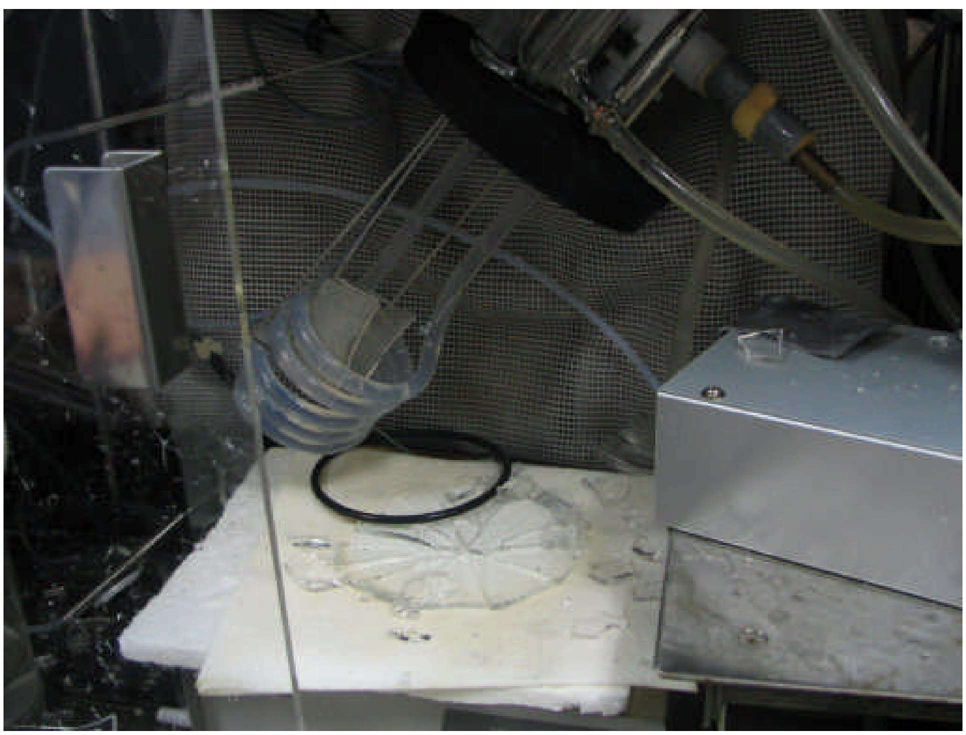

Figure 2. Remains of glow discharge cell after explosion. Photo taken in 2005 by T. Mizuno.