An Edge-on Grid Codeposition Method

Horace Heffner October, 2009

PURPOSE

Here is suggested a means of improving the SPAWAR experimental design as described here:

http://www.lenr-canr.org/acrobat/MosierBosscharacteri.pdf

to (a) avoid scratching or chemical deterioration of the particle detector surface, (b) permit very close proximity of the active material and the particle detector, (c) establish a very thin cell geometry which maximizes external applied field intensities, and (d) permit use of BC-720 plastic from Bicron Inc. or other scintillating material or counters as detectors close to the cathode in order to more definitively determine particle energy level spectra. This means consists of using an edge-on grid method, described below, for co-deposition of the active layer. This method has the added advantage of establishing a cathode surface vs electrostatic field direction relationship similar to the original SPAWAR cell design.

THE METHOD

A method to prepare an edge-on grid is to (a) prepare a primary metallic layer (grid plate) from foil or sheet metal on which co-deposition is to occur (say, silver, gold, or platinum, or a metal for plating such on it) by coating in a grid array an etching mask on both sides of that grid plate, i.e. a conductive plate or foil having one or many central circles not masked, (b) etch out an array of round holes in those circles to complete the grid array, (c) leave the mask on but then plate on any additional layers if desired, thus causing the inside *edges* of the grid holes to be plated, (d) bond 6 micron Mylar (the separation layer) to the back side of the foil, (e) cut a hole in the side or bottom of the electrolyte container of appropriate size so as to bond the edges of the front side of the grid plate to it (probably with chemically resistant epoxy), and then, (f) bond the grid plate edges to the electrolyte container, thus sealing in the electrolyte.

It is possible to sandwich, on the back side of the 6 micron Mylar, i.e. the separation layer, thus unaffected by the electrolyte, particle discriminating layers of various thicknesses and types in front of particle or light detectors or detecting plastic layers like CR-39 or Bicron Inc. BC-720 scintillating plastic. It is further feasible to examine directly, or with intervening materials, one or more grid holes with photomultipliers, cameras, etc.

When running the experiment the codeposited layer is deposited on the inside edges of the grid holes.

VARIATIONS

Another method might be, in place of steps (a) and (b) to coat the primary metallic grid plate with an etching mask and then simply punch or laser etch the grid holes into it.

It may be feasible to use only pressure to hold the 6 micron Mylar in place, as SPAWAR did with magnets. It is also feasible to make bags of the Mylar sheet to surround the cell and back side of the grid as Earthtech did, to prevent any possibility of electrolyte contamination of particle detectors. However, if magnets are used for effect, a much more intense field can be obtained by using soft steel stock to close the magnetic circuit. Soft steel stock is effective and inexpensive.

It is feasible to use very thin glass, ceramic, diamond coated material (even metallic), photosensitive material, or other kinds of sheet materials as a separation layer in place of the Mylar. It is feasible to coat most any layer which is exposed to the electrolyte to achieve far less than a 6 micron separation, i.e. a very thin separation layer and/or masking layer, especially if that layer is a particle discriminating layer. If a coating is used on a detector like CR-39, then it has to be removable by or before etching without affecting the etching results. A layer removable by acid etching might be effective. The main objective of the layer immediately adjacent to the electrolyte, the separation layer, is merely to keep the electrolyte from affecting the next layers. The separation layer, the layer adjacent to the grid, and electrolyte, referred to as 6 micron Mylar above, provides a direct window into a cross section of the co-deposition layer on the surface of the cylindrical hole. A useful separation layer might consist of a UV transparent plastic, like some forms of polypropylene. If the main purpose of a given experiment is to observe light emission in the UV spectrum then a much thicker layer than 6 microns of UV transparent material can obviously and conveniently be used for the separation layer and for focusing the light.

ADVANTAGES

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This overall approach hopefully has the following additional advantages:

1. The stress of the expansion of the hydrogen loaded layer is applied primarily to a longest and thus strongest axis of the underlying metal grid,

2. The layer where the major action is, the codeposited layer, is right up close to (within at most 6 microns of) the discriminating or detecting layers, avoiding long and variable paths of high energy particles through the electrolyte,

3. Hydrogen which diffuses into or through the primary metallic layer (base) has a large volume in which to continue its migration, as it diffuses sideways, as well as an alternate escape path under the mask layer, thus preventing a full buildup of pressure at the metal-to-detector laminations,

4, Micrographs of codeposited D-Pd shows a grainy nature which is not as structurally strong as, for example, a pure Pd loaded lattice, thus the edge de-lamination force for codeposited layers should not be nearly as strong as it was for the Patterson beads, and since some of the Patterson beads survived, hopefully a sufficient number of cells will survive without delamination,

5. By making the grid elements small, say under 0.1 cm, there will be a clear marking of a scale on the micrographs and this will hopefully assist in counting and locating tracks, although the hole diameter should of course be larger than the thickness of the base plate,

6. In the case of multiple plated layers, it will hopefully be clear in the track images from which layer the track originated because the CR-39 (or other material) is essentially imaging a cross section of the plated and codeposited layers.

Discriminating layers can be applied between the separation layer and the detecting layer. This then leaves the layers in order as:

1. electrolyte
2. acid mask with holes for making holes in the grid
3. grid base, a conductor with etched holes, with only the hole edges exposed to electrolyte

4. mask protecting conduction to the base
5. the separation layer which isolates the electrolyte from the discriminating or detecting layers
6. particle discriminating layers, if present
7. the detecting layer, i.e. CR-39, BC-720, or particle or photon detectors

The edges of the holes contain the D-Pd codeposited layer. Assuming the separating layer, and outer underlying layer, are much more compressible than metal, it also provides, in operation, some cushion for the lateral (axial) expansion of the D-Pd codeposited layer, avoiding damage to the underlying discriminating layers or detecting layers.

It is of interest to use high voltage fields in variations (e.g. using the edge-on grid configuration with an insulated HV AC or HV DC electrode adhered to the back of the CR-39) related to Fig. 1 (p. 14) of:

http://www.mtaonline.net/~hheffner/DeflationFusionExp.pdf

and as shown in Figure 1 below. The “1. Metal plate HV anode” shown in Figure 4 can be replaced with a transparent material, e.g. an electrolyte, if viewing the active anode surface is desirable.

To see the value of the edge-on grid method, consider that the edge-on grid method can be implemented with even a single large (e.g. 1/4 inch) hole in a cathode plate (or thick foil). This in fact was the initial concept. The purpose is to avoid problems and variabilities due to pressing wires against a CR-39 detector. Coating the grid plate with etch resist provides a barrier to the electrolyte there superior to Mylar, because leaking around the Mylar edges has been experienced. When the edge of the hole is used for the cathode surface, there are no concerns about keeping wires in place, and varying pressures up against 6 micron Mylar, which easily rips, nor concerns regarding bubbles that form under the Mylar etc. By choice of hole size, and amount of co-deposition, the amount of stress the Mylar or other covering has to handle can be controlled. By choice of grid plate cathode thickness and hole size and number of holes, the surface area for co-deposition can be controlled. The cell geometry is far more controlled than it can be by using wires for cathodes and pressing them up against the Mylar. The edge-on geometry with regard to the electrostatic field is identical to the original SPAWAR cell, i.e. Szpak cell, see :

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http://lenr-canr.org/acrobat/SzpakSprecursors.pdf

http://www.mtaonline.net/~hheffner/Szpak.pdf

by which anomalous effects of electric and magnetic fields were observed on the co-deposition layer, and cold fusion was observed with increased reliability as well. The edge-on geometry may be useful in continuing investigation of these anomalies.

One of the useful features of the edge-on grid method is the ability to drive the electron density very high right at the surface nearest the particle detection means by placing the insulated HV electrode behind the CR-39 or whatever particle detector chip is used. Also, if the the back side mask is not used, and Mylar not used, it might be possible to photograph in the EUV range by use of a thin polypropylene lens right up against a hole edge (replacing the CR-39), with the lens backed by a vacuum chamber with camera.

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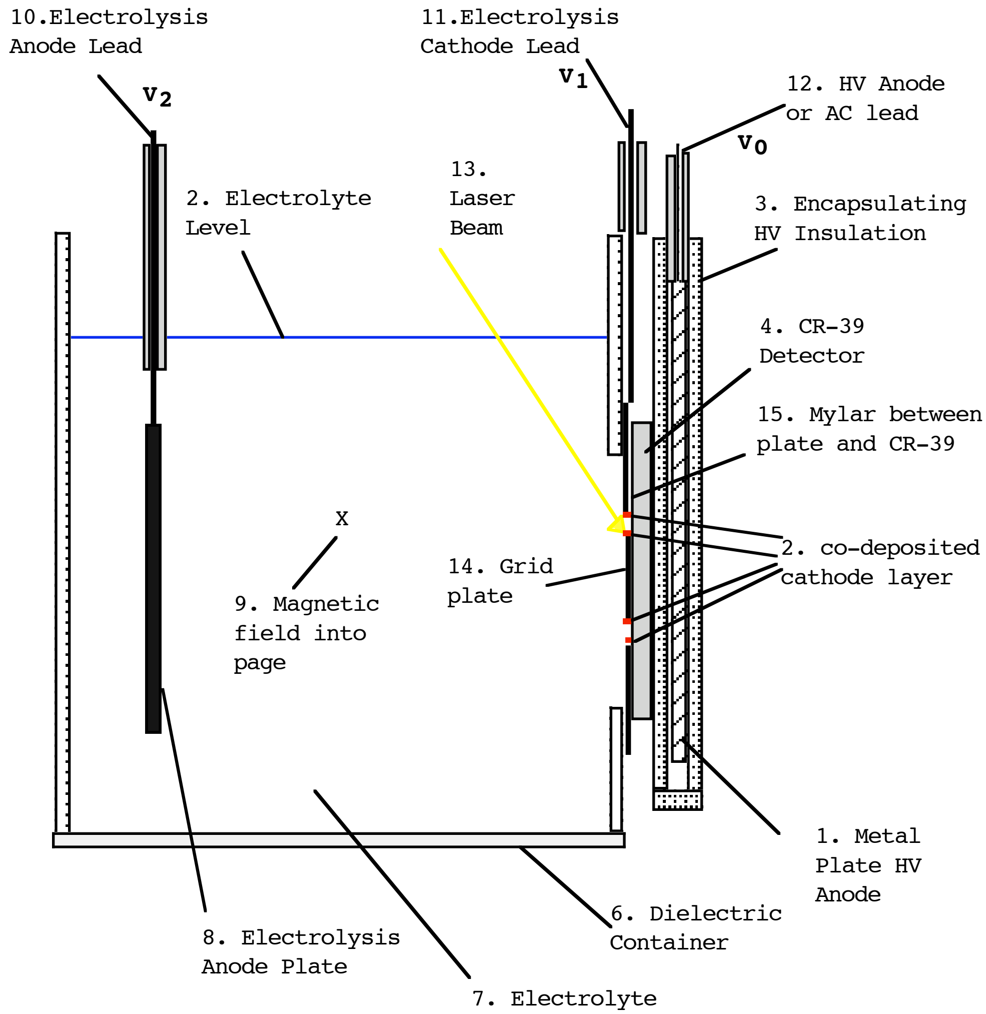

Figure 1 - Cross section diagram edge-on grid experiment