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MAIL STOP: EKS-145
TELEPHONE: C348
(505) 667-5818

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Science

Editor
1333 H Street, NW
Washington, DC 20005

Sir:

This is a letter to the Editor concerning the article written by Gary Taubes (Science June, 1990). I request this be published in Science as soon as possible in fairness to Texas A&M University in particular and to the field of cold fusion in general.

The accusation made by Gary Taubes that cold fusion cells at Texas A&M University were "spiked" with tritium can be easily tested. It is not even necessary to trust the people at Texas A&M or Mr. Taubes. All that is required is to add tritium to an electrolytic cell and see if it behaves like the tritium claimed to be produced from cold fusion. This has been done and the results show that the tritium claimed to result from cold fusion can not be caused, at least in some cases, by the addition of tritiated water. Unfortunately, many of the cells at Texas A&M were not studied in sufficient detail to allow this conclusion to be applied to every cell. Nevertheless, the reality of tritium production as a phenomenon can not be challenged on the basis of this accusation. I sent the results described herein to Gary Taubes (4/9/90) before his article was published. Unfortunately, he chose to ignore this information.

In order to arrive at the above conclusion, two factors need to be compared. One factor is based on the time history of tritium concentration in the electrolyte and the other is based on the distribution ratio (tritium in the evolved gas divided by that in the electrolyte).

Cells that are claimed to produce tritium show a characteristic pattern of tritium production. After a time interval that can be as short as several days or as long as sever al months, the tritium content of the electrolyte begins a steady increase that lasts sever al days to several weeks. Bursts in the production rate have been observed. After the cell stops production, the tritium content rapidly decreases over several days and approaches a constant loss rate. The initial loss of tritium is caused by removal of dissolved DT gas from the electrolyte by the constant production of D 2 gas at the cathode

and the later loss rate is caused by dilution. Dilution results from replacing the electrolyzed fluid and sampling specimen by heavy-water having a lower tritium content.

Figures 1 shows this behavior for a cell (#4) studied at Texas A&M[1]. The gas phase over this and several other cells at Texas A&M contained a much higher tritium concentration for a-brief time than did

the electrolyte. This indicates that the production rate of DT gas exceeded the rate at which it could exchange with dissolved gas as the evolved gas bubbled through the electrolyte. These bursts of tritium in the gas correspond to measured increases in the tritium content of the electrolyte. Therefore, some of the tritium generated at the cathode was able to enter the electrolyte as DT and/or DTO. Because the sampling interval was only daily and because of the unknown amount of recombinate, it is not possible from this figure to compare the total amount of tritium in the gas to that in the electrolyte. After the last tritium burst, the tritium content of the electrolyte decreased and approached a constant rate of decrease after several days.

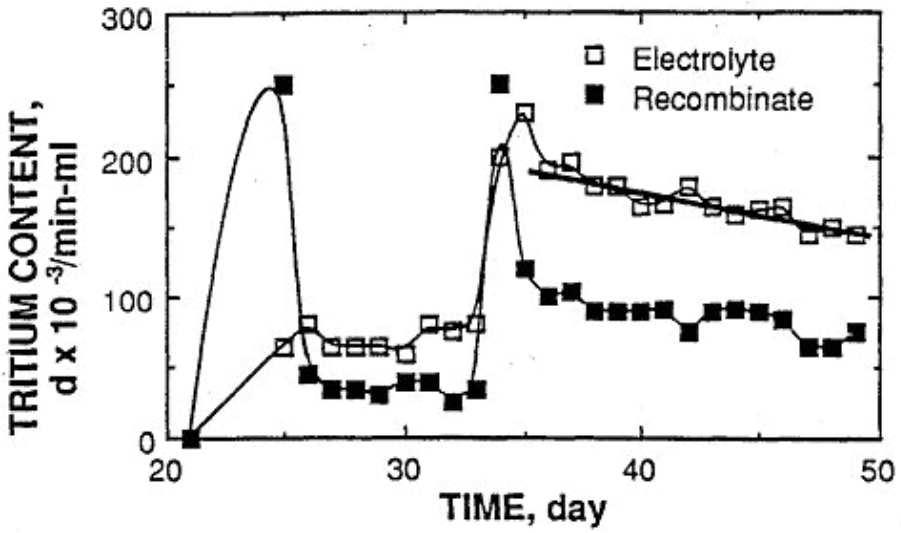

FIGURE 1. The plotted disintegration rate is that in excess of the normal tritium content FIGURE 1. The plotted disintegration rate is that in excess of the normal tritium content of the electrolyte. [1] No excess tritium was seen until 23 days after electrolysis started. Excess heat at a level near 18% was measured before, during and after tritium production with an indication of bursts in heat production coinciding with the tritium bursts. The light lines are drawn only to show how the data are connected in time.

Figure 2 shows the behavior of a cell studied at Los Alamos which was in a group of active cells. Interestingly, cell #4 at Texas A&M and the group at Los Alamos started producing tritium within 10 days and stopped within one day of each other. In contrast to the Texas study, the tritium production rate in the Los Alamos cell was so low that excess tritium was not found in the gas phase. The same tendency exists to show tritium bursts and to show a relatively rapid decrease in tritium content over several days after production ceased.

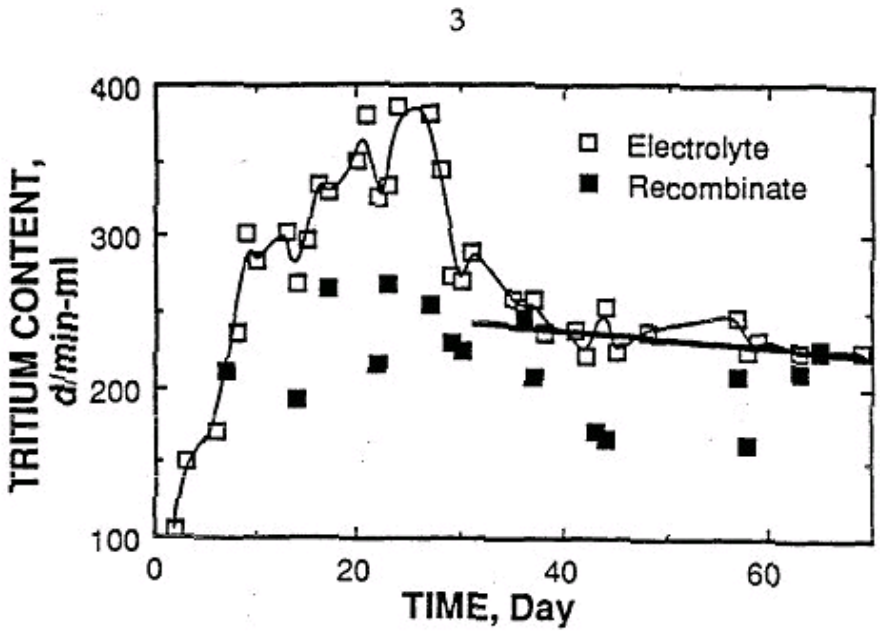

FIGURE 2. This was a sealed cell containing a catalyst which allowed the gas to recombine and collect separately as the recombinate. Details can be found in ref. [2]. All tritium entering and leaving the cell was measured. The standard deviation of the disintegration rate for the electrolyte is ±14 d/min-ml, about the size of the points. A larger error is expected for the recombinate because of the way samples were taken. The disintegration rate is plotted as a function of time after electrolysis was started on 9/7/89.

To test the behavior of a spiked cell, we added tritiated water to an inactive D *2* 0 cell that had been running for 125 days without producing tritium. After the tritium was added as HTO, a complete inventory was kept of tritium that was added to the cell in the replacement D *2* 0 and that left in the gas phase and during sampling. Figure 3 shows the tritium concentration in the electrolyte as a function of time. [31 The steady drop is caused by dilution when the electrolyzed D *2* 0 was replaced by D *2* 0 having a lower tritium content. In addition, a small amount of enrichment would be associated with this process because the gas has a lower T/D ratio than does the liquid. If these two factors are taken into account, the excess tritium content of the electrolyte remains constant. This analysis shows that there is no mechanism to cause the tritium content of the electrolyte to drop rapidly to a constant rate of decrease if tritium is added as tritiated water. The addition of tritiated water produces a constant rate of loss immediate ly after its addition. Only the addition of gaseous tritium would produce behavior similar to that observed in the cold fusion cells. It is hard to believe that someone at Texas A&M would realize this behavior to be characteristic of cold fusion cells, have HT or DT gas available and have the equipment to bubble this gas through the electrolyte at just the right rate.

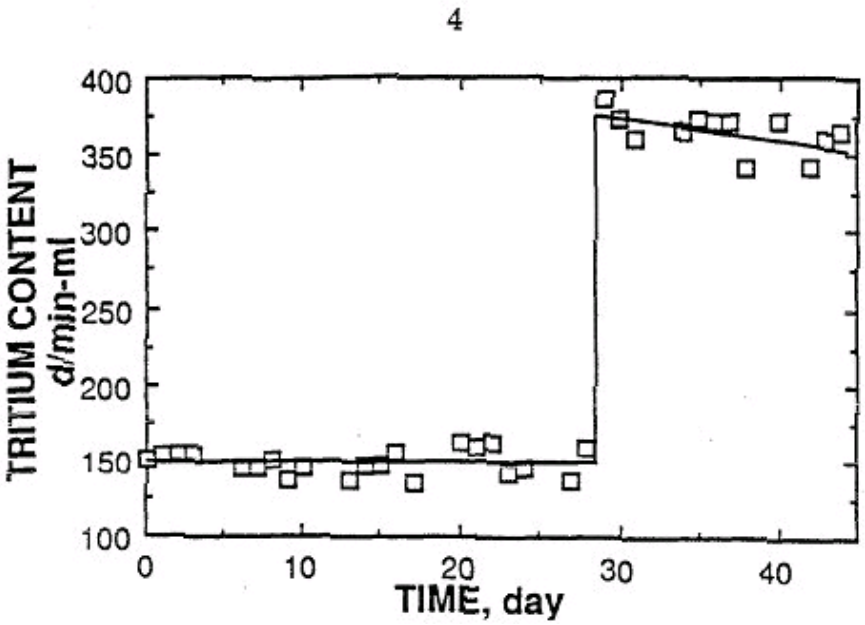

FIGURE 3. The standard deviation of the disintegration rate is ±14 d/min-ml. The disintegration rate is plotted as a function of time starting at an arbitrary time.

The appearance of a high tritium concentration in the gas phase (Fig. 1) also sheds light on this issue. Both experiment and theory agree that the addition of tritiated water does not change the distribution ratio significantly. Even extreme changes in cell conditions are found to produce values between 0.45 and 0.65. Yet, several cells at Texas A&M showed more than 100 times as much tritium in the gas as in the electro lyte. Again, this behavior is not consistent with tritiated water being added to the cells. Of course, tritiated water could have been added to the collected recombinate to make the gas phase appear to be high in tritium. The need to do this would have had to be recognized and the amount chosen correctly at the right time. Although this possibility can not be ruled out, it seems very unlikely to me. In addition, if cell #4 had been spiked, the job would not have been simple nor quickly done.

According to the cold fusion group at the University of Utah, tritium has been produced by at least 20 groups throughout the world. In addition, over 60 groups have found some evidence for the cold fusion effect including heat, neutrons, protons, gamma rays and X-rays. Some of this work, especially in India[4] and Japan, has been very successful and is being published regularly in Fusion Technology as well as in other journals. To suggest that the cold fusion effect is not real because there is a suspicion of fraud and contamination at one institution, is exceedingly irresponsible.

[1] J. O'M. Bockris, G. H. Lin and N.J.C. Packham, "A Review of the Investigations o f t he Fleischmann-Pons Phenomena , Fusion Technology, July (1990).

[2] E. Storms and C. Talcott, "Electrolytic Tritium Production", Fusion Technology, July (1990).

[3] E. K. Storms and C. Talcott, "A Study of Electrolytic Tritium Production", The First Annual Conference on Cold Fusion, Salt Lake City, Utah, 28 Mar. 1990.

[4] P. K. Iyengar and M. Srinivasan (ed.), "BARC Studies in Cold Fusion" Bhabha Atomic Research Centre, Trombay, Bombay, BARC-1500, Dec. 1989. Will appear in Fusion Technology, July (1990).

Sincerely,

Edmund Storms

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Cy: CRM-4, MS A150, w/o enc.
MST-3 File, w/o enc.
R. Slansky, MS B210
John Webster, MS A177
Gary Taubes
748 18th Street
Santa Monica, CA 90402
John Bockris, Texas A&M University
Department of Chemistry
College Station, TX 77843-3255
Walter Polanski, U.S. Department of Energy
Basic Energy Sciences
ER-16, GTN
Washington DC, 20545