Success in Making Tritium

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What is Tritium?

- An isotope of hydrogen containing 2 neutrons.
- Beta emitter with an average energy of 5.7 keV (18.6 keV max) and a half-life of 12.3 years to give ^{3}He.
- Found naturally in gas from deep vents in earth and in atmosphere from bomb tests and accidental release.
- Present in all D_2O.
- Biological hazard in large amount.
- When it results from d-d fusion by the hot fusion process, it is accompanied by a neutron.

How Detected?

Because the emission has very low energy, tritium is detected:

- As gas using electric discharge triggered by the beta emission.
- As water using scintillation counting.

Reasons to question claims

- Contamination
- Preferential concentration in D_2O
- Poor measurement, chemiluminescence
- Added on purpose

Importance of Tritium

- Can only be produced by a nuclear reaction
- Because it is produced without neutron emission, it does not result from hot fusion.
- Its presence is unambiguous
- Forces a direction to the explanation for CF.

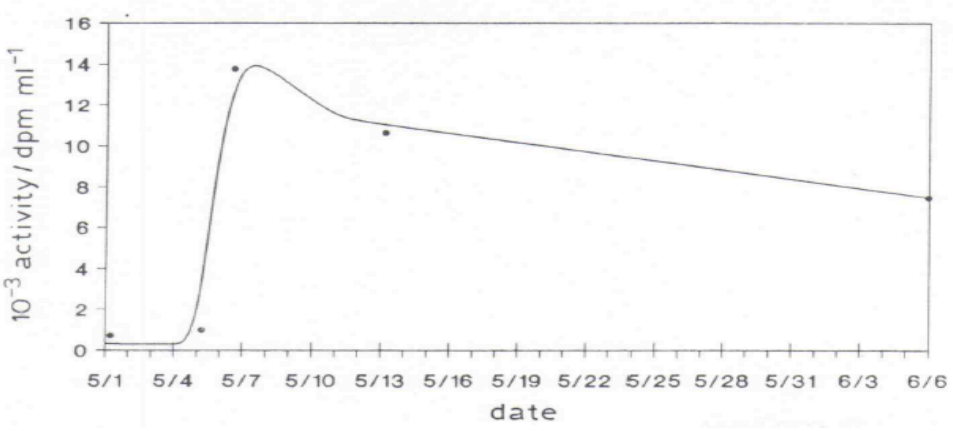
Evidence for tritium production.

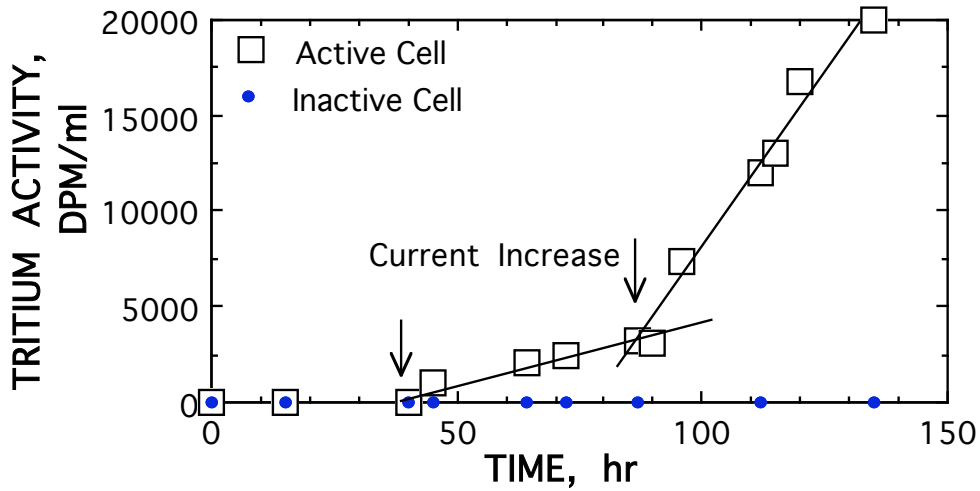
- Bockris et al. (Texas A&M)
- Storms et al. (LANL)
- Claytor et al. (LANL)
- Will et al. (NCFI)
- Szpak et al. (NOSC)
- Guruswamy (U of U)
- India
- Italy
- Russia
- Japan
- Spain

Texas A&M

Packham et al., J. Elecctroanal Chem. 270 (1989) 451-458
Chien et al., J. Electroanal. Chem. 338 (1992) 189-212

- Pd wire cathode, Ni connection wire and anode, 0.1 M LiOD (99.9%D), loaded for ~28 days. Samples checked at LANL, ANL, GM Battelle.
- Chemiluminescence measured, beta energy measured, metals examined for tritium, enrichment considered.
- $2x10^{12}$ atoms T/ml maximum
- H_2O increased to 9.8% in 22 days.

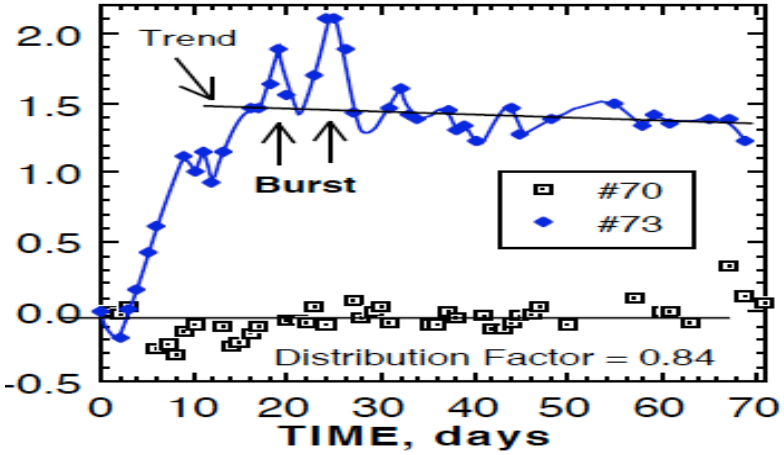


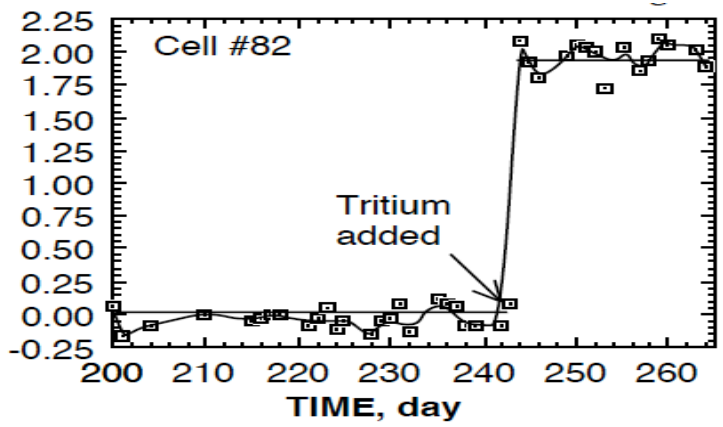


LANL

Storms+Talcott, Fusion Technol. 17 (1990) 680

- #73 and #70 run at same time. Fraction excess shown (1.0 = tritium doubled). #73 heated in paraffin vapor. 0.1M LiOD + many pretreatments.
- T in Pd goes into gas - T from CF goes into electrolyte.

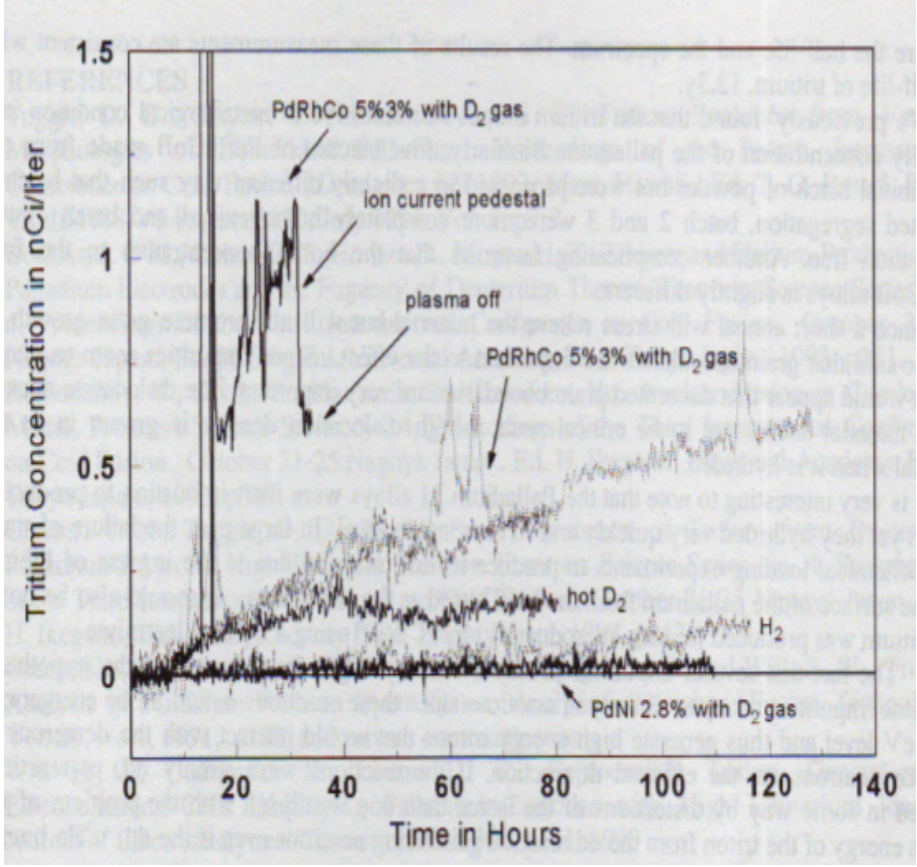




LANL

Claytor et al., reported at ICCF-2, 7 and other conferences

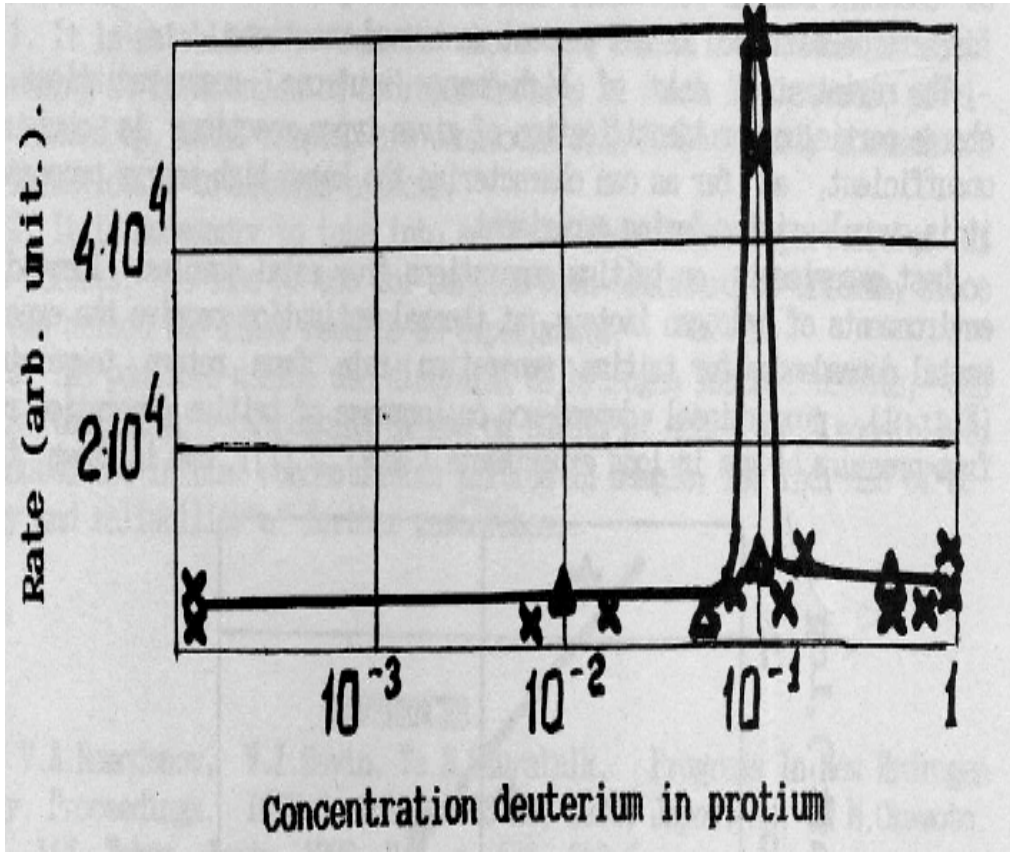
- Electric discharge through Si powder separated by Pd foil.
- Electric discharge through D_2 gas using Pd alloy cathode.



LUTCH, Russia

Romodanov et al., ICCF-7 (1998)

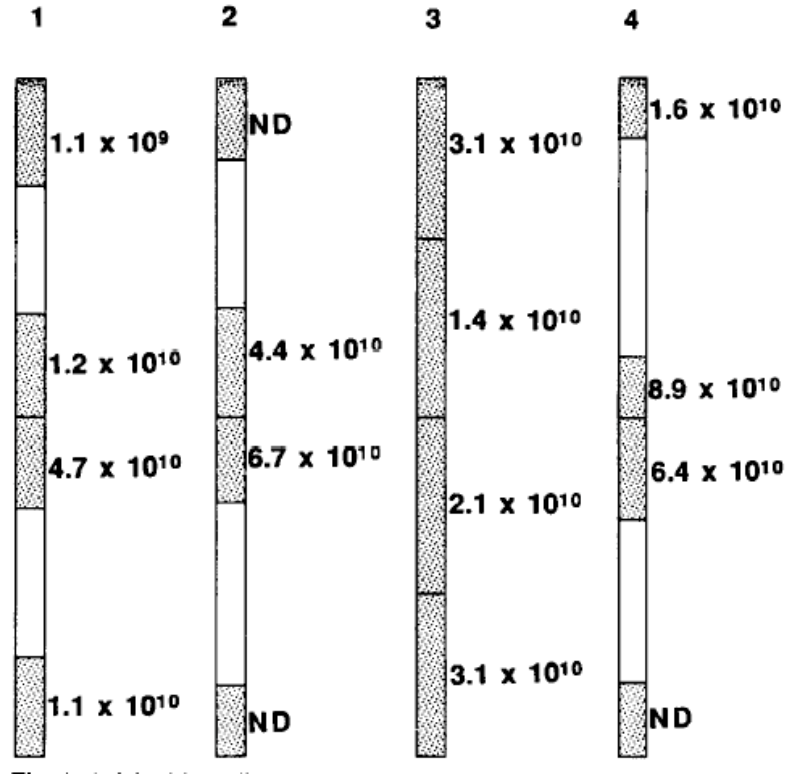
- Gas discharge on Fe-Cr-Ni-Ti cathode, 200-1000 V, 20-60 x10^3 Pa.
- 10^9 atoms/sec
- n/t = 10^{-7}to10^{-9}



National Cold Fusion Institute

Will et al., J. Electroanal. Chem. 360 (1993) 161-176

- Closed cell, 0.5 M D_2SO_4+D_2O, Pd wire - Pt anode, high loading not sufficient, x100 increase.
- 0.13% H_2O added/day
- No T found using H_2O.
- No T found in unused Pd
- T content variable along length of Pd (x100 det. limit).

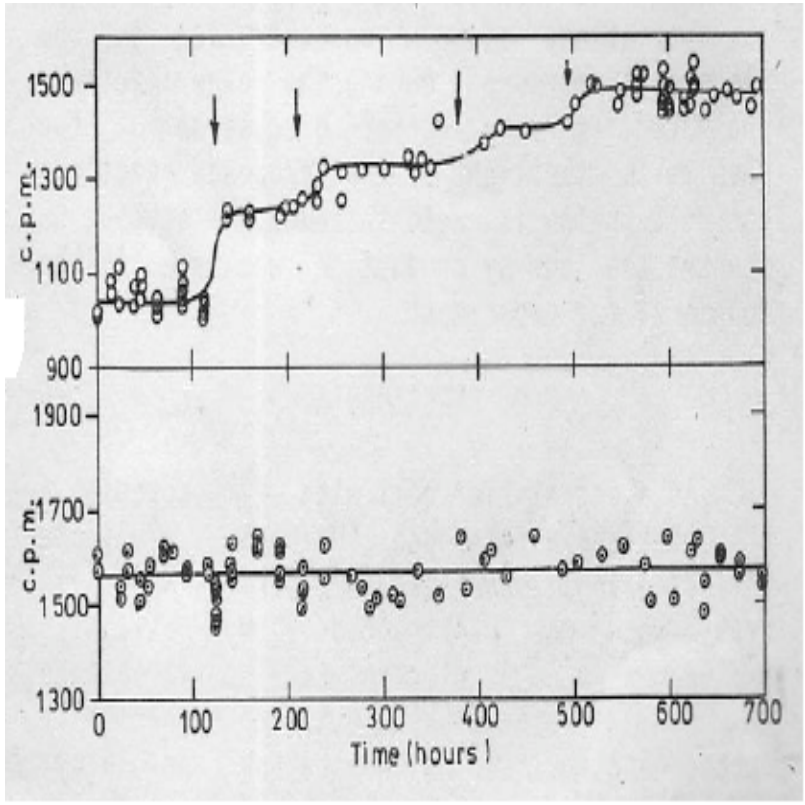


Univ. Autonoma de Madrid

Sanchez et al., Solid State Commun. 71 (1989) 1039

EXAMPLE OF HOT FUSION

- Ti cathode+Pt anode, Li_2SO_4+D_2O,
- NaI gamma detector - burst shown by arrow.
- BF_3 neutron detector - bursts seen.
- Lower figure - no gamma or neutrons



Conclusion

Tritium production is real!!

- Pd produces tritium without neutrons.(CF)
- Ti produces tritium with neutrons. (HF)
- Tritium production seems to be related to product of D and H concentrations in environment.
- Tritium production increases with increased D in PdD.
- Tritium and helium production require similar conditions.