

Laboratory Evidence Demonstrating d-d Cold Fusion in Metals

Since the initial announcement of the Fleischmann-Pons effect[1] there has been substantial laboratory progress in establishing the reality of excess heat produced by radiationless d-d nuclear reaction in the deuterium-palladium system. Selected experimental achievements are listed below.

1. Increasingly clear observations of excess heat in heavy water electrolysis experiments using palladium cathodes. Early work is well summarized in Charles Beaudette's new book [2], "Excess Heat & Why Cold Fusion Research Has Prevailed", (Oak Press, LLC, South Bristol, Maine, USA, 2000). (1989-1991)
2. Fleischmann and Pons discovery of hours-long heat production in Pd cathodes after electrolysis turn-off [3]. This phenomenon is called "heat after death". (1993)
3. Mass spectrometer observations of helium-4 in the electrolysis off-gas in experiments by Miles [4], B. Bush, McKubre, and Tanzella [5]. Results were presented by McKubre at the Western Regional Meeting of the American Chemical Society, Ontario, California in October 1999, and also at the ICCF8 Meeting in Lerici, Italy in May 2000. Observed helium was quantitatively measured and shown to have been produced at rate of 1 helium atom per 24 MeV of released heat. (1993, 1999)
4. Arata and Zhang development of the DS-cathode [6], which has produced watts of excess heat 10 times in a row when used with the Arata and Zhang protocol [7]. (1994)
5. Successful transfer of the Arata and Zhang DS-cathode technology developed at Osaka University to the McKubre laboratory at SRI [5]. (1999)
6. Observation of heat and helium-4 generated in D₂-loaded 0.5% Pd-on-carbon catalyst, observed by Case [8] and verified by McKubre et al. [5] (1998, 1999)
7. Observation of by-product helium-3 by Arata and Zhang [9] and with great clarity by Clarke and McKubre et al. during study of materials from previously run DS-cathodes. Helium-3 was repeatedly observed at a helium-3/helium-4 ratio greater than 10000 times ambient value [10]. (1997, 2000)
8. Observation of tritium in gas from a post-run DS-cathode, as measured by the build-up of helium-3 in stored chemically-purified hydrogen samples by Clarke, Oliver, and McKubre et al. [10] (2000)

Laboratory Evidence Demonstrating a Potential for Major Power Production

9. Clear observation by Liaw et al. [11] for 25 W of excess heat at greater than 460°C during anodic deposition of D⁻ ions onto a Pd anode from a molten salt electrolyte.

Excess power exceeded electrolysis input power by factor of 15; power density was 627 W cm⁻³ Pd; duration of high power was 1 day, of elevated power was 4 days. Power controlled by current density. Single successful anode. (1990)

Laboratory Evidence Demonstrating Connection between dd Fusion and LENR Transmutations

- This research provides a connection between dd cold fusion and Low Energy Nuclear Reaction transmutations. It may also be teaching a good way of producing the nuclear active state.

10. Observations by Iwamura *et al.* of conversion of surface cesium atoms into praseodymium atoms induced by deuteron diffusion through a Pd plate containing internal diffusion barriers [12]. A clean experiment repeated 6 times, with many controls. The transmutation requires that the Cs atoms absorb 8 deuterons or equivalent.

References

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