Progress in Cluster Enabled LENR

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Initial thin-film electrolytic LENR studies lead to the investigation of ultra-high density regions of Deuterium found in voids or dislocation loops in the films [1-2] Hydrogen "clusters" in these regions were estimated to have roughly 100–1000 atoms with superconducting properties below 70 °K as shown by SQUID measurements [3]. Subsequently, ways to increase the clusters per cc were studied, typically using multiple loading-deloading techniques to build up voids and dislocation loops near film interfaces. Later, we extended these techniques to the creation of clusters in pores in nanoparticles employed in our gas loading experiments [4]. The nanoparticles are formed from various alloys ranging from Pd-rich to Ni-rich zirconia based materials. Deuterium or hydrogen gas at pressures up to 100 psi is used, with the Pd-rich or Ni-rich nanoparticles, respectively. The LENRs are initiated by an initial temperature rise associated with gas absorption in the nanoparticles. Depending upon conditions, LENR heating then rises to 300–400 °K, followed by a slow drop off over about 4 hours under constant pressure conditions. This drop off is attributed to a decrease in H/D flux with static pressure, cf. the need for voltage pulses in the earlier thin film electrolysis work. Periodic pressure variations are employed to obtain controlled runs over much longer periods. Sin addition other methods for initiation and run time control of the reactions have been investigated with varying results. The run methods have been explained in terms of flow-momentum exchange between diffusing gas ions and the clusters. Considerable attention has been devoted to studies of both Hydrogen and Deuterium pressurized nanoparticles in recent studies [5]. The relation between these studies and the earlier thin-film plus nanoparticle work will be discussed in detail.

[1] G. H. Miley, J.A. Patterson, "Nuclear Transmutations in Thin-Film Nickel Coatings Undergoing Electrolysis," J. New Energy, Vol. 1, no. 3, p. 5, 1996.
[2] G. H. Miley, "Product characteristics and energetics in thin-film electrolysis experiments," 7th International Conference on Cold Fusion (ICCF-7), Vancouver, Canada, 1998.
[3] A. Lipson, B.J. Heuser, C. Castano, G. H. Miley, B. Lyakhov, A. Mitin, "Transport and Magnetic Anomalies below 70 °K in a Hydrogen-Cycled Pd Foil with a Thermally Grown Oxide," Phys. Rev. B., Vol. 72, p. 212507, 2005.
[4] G. H. Miley, X. Yang, and H. Hora, "A potentially game changing 'green' power source based on Low Energy Nuclear Reactions (LENRs)," Nuclear and Emerging Technologies for Space 2012 (NETS 2012), The Woodlands, Texas, 2012..
[5] See other presentations by IH Team members at this conference