## Wave Nature of Deuterium Flux Permeating through the Palladium Thin Film with Nanometer Coating Lavers --- (I) Experimental Observation

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Wave nature of deuterium flux permeating through the palladium thin film is revealed using nanometer coating layers. Three sets of experimental data[1,2,3] agree with wave in multiple-layer theory quantitatively or qualitatively. Other than granular particle diffusion model and surface catalyst model, the wave nature of deuterons inside the coating layers must be included in order to explain the experimental phenomena.

The anomalous deuterium flux permeating the thin wall of palladium tube showed a peak while the temperature of Pd tube was monotonically decreasing through 150°C to 120°C [1]. It was a hint that other than the diffusion there must be some different mechanism governing the deuterium flux permeating the thin Pd film, because diffusion coefficient was supposed to be a monotonic function of temperature. When deuterium molecule dissociated into 2 atoms, and entered the Pd surface as if a granular particle, it would be reflected by the single surface layer only. However, if its behavior was similar to that of a wave; then, it would feel more layers behind the surface layer. The reflecting wave from the surface would be determined not only by the surface layer, but also by the layers behind the surface. Then the reflection of wave should depend on the interference of several reflecting waves from several layers, and manifest itself a peak-wise behavior. This distinct feature might be tested by a deuterium flux

permeating through a palladium thin film with multiple nanometer coating layers. Fig.1 shows the schematics of the apparatus, and the following plots show some results of observation. Under the same conditions, the Pd film with coating layers (Pd-TiC-Pd) has greater deuterium flux than Pd film without coating lavers does unexpectedly.



[1] Xing Zhong Li, Bin Liu, Jian Tian, et al. J. Phys. D: Appl. Phys. 36 (2003) 3095-3097.

[2] Xian Z. Ren, Thesis for Master Degree of Science at Tsinghua University (2003).

[3] Jing Li, Thesis for Bachelor Degree at Tsinghua University (2006).

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ICCF-15, Oct.9-15,2009, Rome, Italy





## No Coating Layer, Pd Film in D<sub>2</sub> ;then, in Air



## 1 Coating Layer, Pd Film in D<sub>2</sub> ;then, in Air



Time (Sec)



