Temperature Dependence of Excess Heat in Gas-Loading Experiments

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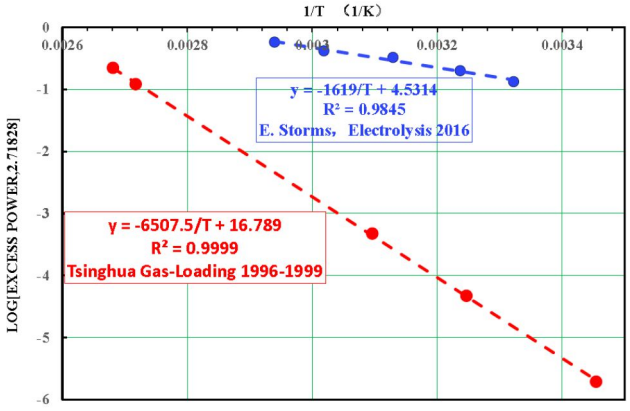
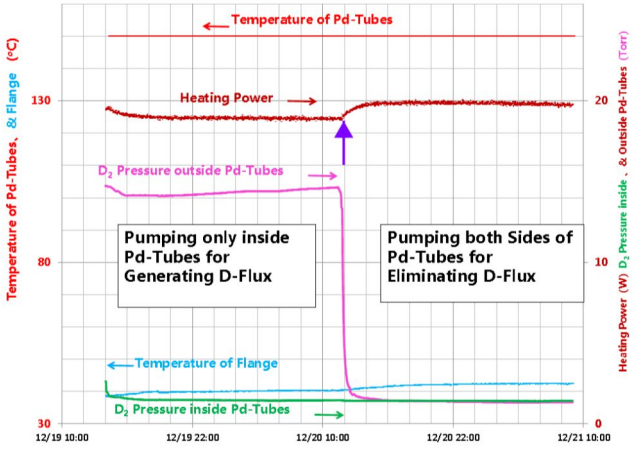
Two additional sets of data support the temperature dependence of excess heat-- a straight line in semi-logarithmic plot published by E. Storms.



（1） In 1996-1999, a series of gas-loading experiments were conducted at Tsinghua University in order to detect the temperature dependence of excess heat. A long-thin Pd-wire ($250mm \times \phi 0.34mm$) was immerged in deuterium gas. The Pd-wire was heated to a specified temperature (50, 95, 100 °C) by a computer-controlled DC power supply. When we pumped out the deuterium gas, the de-gassing process on Pd-wire was supposed to be an endothermic process; however, the necessary DC power for keeping the specified temperature was dropped. It showed an exothermic process in Pd-wire with pumping. This exothermic effect could be quantitatively measured by the reduction of DC power. Two more data points at (35, 16.5 °C) were obtained using cooling curves and temperature cycling methods without pumping Fig.1 shows these excess heat effects at 5 temperatures They are on a straight line (red line) similar to that discovered by E. Storms in heavy-water electrolysis experiments (blue line).



（2） In 2010~2014, in order to confirm the effect of deuterium flux and exclude the heat-conducting effect of deuterium gas, a series of gas-loading experiments were conducted using a bunch of 7 Pd-tubes ($7 \times 400mm \times \phi 2mm \times 0.08mm$) in a vacuum chamber. The Pd-tubes were heated to 150°C by a computer-controlled DC power supply again. The deuterium gas was filled into the chamber outside of Pd-tubes only while the gas inside of Pd-tubes was pumped out. Thus a deuterium flux would diffuse through the thin wall of Pd-tubes. Next day morning, we pumped both sides of the Pd-tubes to stop the deuterium flux. The data showed a clear increase of DC power (Fig.2, red line, purple arrow), although the necessary heating power for a specified temperature was supposed to decrease due to the reduction of heat-conducting of deuterium gas. Evidently, it showed that the deuterium flux before 12/20/12:00 induced the excess heat. Pumping per se did not induce the excess heat.

Two sets of data supported not only the temperature dependence of excess heat in gas-loading experiment, but also revealed the diffusion nature of this straight line. Consequently, a resonant surface capture model has been proposed to relate this inelastic process (excess heat of nuclear reaction) to an elastic process (diffusion process in crystal scale) (see another abstract for ICCF-21).