U. Mastromatteo[(1)], F. Celani[(2,3)] , A. Bertelè [(1)]

[(1)] STMicroelectronics, via Tolomeo, 1 20010 Cornaredo Milano-Italy
[(2)] Nat. Inst. Nucl. Phys., Frascati Nat. Lab.; Via E. Fermi 40, 00044 Frascati (Rome), Italy,
[(3)] Int. Soc. Cond. Matt. Nucl. Sci.; Latium#1 Group; Via Cavour 26, 03013 Ferentino (FR)-Italy.

Introduction

Constantan wires with a diameter of 200 microns and 25 to 60 cm length, previously treated to induce the formation of nanostructured layers on their surface, were used for excess heat tests in hydrogen atmosphere at different temperatures (Fig. 1).

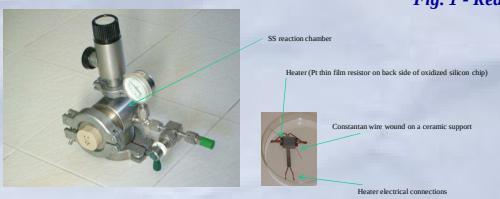

Fig. 1 - Reaction chamber and typical sample holder

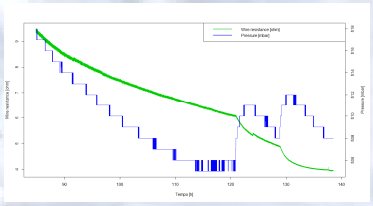

Fig. 2- The graph shows the wire resistance and pressure decrease overcoming a threshold temperature (temporary pressure increase is due to programmed temperature increase).

H2 absorption

Heating the wire from ambient temperature up to a maximum temperature of 350 °C, the reactor and wire main parameters were continuosly monitored (heater power, wire resistance and temperature, chamber temperature, hydrogen pressure, ambient temperature).
Overcoming 150 °C, was observed a substantial decrease of the wire resistance, as already highlighted in previous experiments with similar material (Fig. 2) [1]. An estimate of the H/Ni ratio can be done considering that the volume of the chamber is about 300 cc and the initial pressure 500 mbar. So, the pressure change (three steps) is about 3.5% , corresponding to 4.7 10^{-4} H_2 absorbed moles; 40% of Ni in the wire (120 mg) means 48 mg = 8.3 10^{-4} moles, and then 4.7 x 2 / 8.3 = 1.1 H/Ni ratio.

EXCESS HEAT PRODUCTION

The Fig. 3 screen shot summarizes the trend of the excess power produced in several experiments within the reactor of Fig. 1. Some experiments concerning reactor calibration have been done without "active“ material on the heater. Anyway, it was observed that also tests with the active material had a thermal trend similar to that of the calibration test or with very small excess power. Several experiments instead showed a clear (up to about 2W) decrease of the power to be input from the outside to reach the temperature of the chamber established by the calibration curve (X axis, Treactor-Tambient), therefore attributable to an extra heat production inside the reactor. All data shown were obtained with indirect heating of the wire, that is, using the heater of platinum underneath the silicon chip. It can also be noticed that until a wire temperature of 120 °C the excess power value for all the test is under the estimated error (dotted line) while the higher deviation from the calibration curve is at 300 °C (2.2 W).

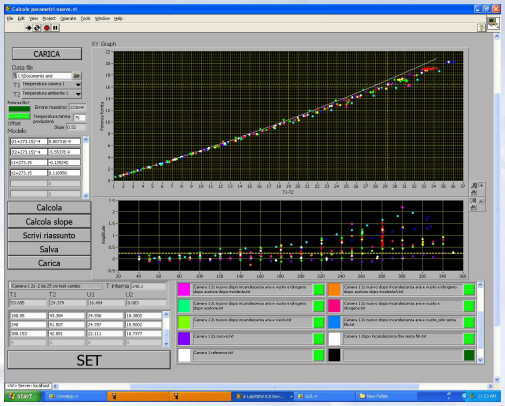

Fig. 3- excess power evaluation

Transmutations

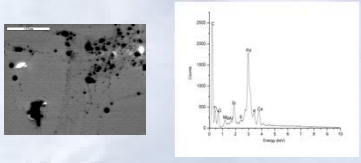

Fig. 4a- EDX Spectrum of a spot on Pd sample processed 76 days with 2mW/cm² He-Ne laser.

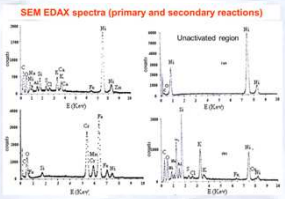

Fig. 4b- Ni-H experiments. Source: Poster presented at the 2005 Pontignano workshop by Prof. Piantelli and collaborators

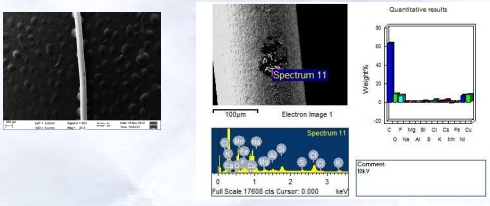

Fig. 4c- EDX Spectrum of a spot on Constantan wire after an excess power experiment.

EDX analysis of the active wire after a “positive “ test (with excess heat) showed many hot spots with the presence of elements unrelated to the original composition of constantan wire (Fig. 4c). The elements found are the same also highlighted by other researchers in similar test conditions (Fig. 4b), but with different materials. Similar findings were also observed with thin films of palladium in deuterium or hydrogen atmosphere at room temperature; in the case of hydrogen atmosphere only with irradiation by means of low-power HeNe laser (Fig. 4a) [2]. What is important to notice is that the atomic weights of “detected” elements are all below the Nickel or Palladium ones; in our opinion this important nuclear signature deserves more attention by researchers with the purpose of obtaining a better interpretation of these important anomalies.

References

[1] F. Celani et al., “Experimental results on sub-micro structured Cu-Ni alloys..”, at X Inter. Workshop on Anomalies in Hydrogen-Metal Systems, Pontignano, Italy, April 10-14, 2012, publishing in (J. Chem. Mat. Res.; March 2013).
[2] V. Nassisi et al., Modification of Pd–H2 and Pd–D2 Thin Films Processed by He–Ne Laser; J. Condensed Matter Nucl. Sci. 5 (2011) 1–6