ACS NEW ENERGY TECHNOLOGY SYMPOSIUM

Francis Tanzella, Pamela Boss and Melvin Miles

The fifth New Energy Technology Symposium was held at the 241st American Chemical Society (ACS) meeting at the Sheraton Park Resort in Anaheim, California on March 27 and 28. The organizer of the symposium, Dr. Jan Marwan of Dr. Marwan Chemie, was unable to chair the meeting due to personal reasons. However, the sessions of the symposium were co-chaired by Dr. Francis Tanzella of SRI International, Dr. Pamela Boss of SSC-Pacific and Dr. Melvin Miles of Dixie State College. The meeting started with a moment of silence in honor of Dr. Scott Chubb, who had passed away on March 25 after a two-year battle with cancer. A sympathy card was signed by some of the session participants and sent to Scott's wife and family.

The New Energy Technology Symposium was divided into three topic areas. The first topic area was "Theoretical Approach to LENR/Cold Fusion." Due to cancellations, only five speakers presented during the first session.

Prof. Akito Takahashi (Kobe University, Technova) was the first to discuss the phenomenology of Pd/ZrO_2 and $Pd/Ni/ZrO_2$ nanoparticle/gas-loading experiments. In addition to measurements of temperature and pressure, neutron and gamma spectroscopy were performed during these experiments. No nuclear results were presented. Rapid overloading, with D(H)/M>>1.0, was seen in the deuterium loading experiments of 2nm Pd nano-particles (provided by Ahern), as opposed to similar experiments using 6-10nm and 100nm Pd nano-particles, and much faster than that seen with hydrogen loading. In addition, the enthalpies of absorption/adsorption were 2 to 7 times larger than that seen for the bulk. The sorption energy was 3 to 30 times greater than the desorption energy. One sample, $PdNi7ZrO_2$, showed a deuterium loading ratio of greater than 3.

Takahashi also described his model of a MDE mesoscopic catalyst as a core-shell structure consisting of a mono-metal particles (with an oxide layer) suspended in a larger ceramic support particle. In the Ni-rich system the Pd atoms are surrounding a cluster of Ni atoms to form a particle suspended in the zirconia matrix. This structure allows better access to the tetrahedral and octahedral adsorption sites in both the Ni and Pd atoms.

Olga Dmitriyeva (Coolescence, University of Colorado) performed experiments somewhat similar to those presented by Takahashi but using Pd nano-particles suspended in alumina or zeolite particles. She concluded that H-D exchange can yield all combinations of molecules containing H, D and O, and that the reaction can be exothermic or endothermic. This led to the conclusion that the excess heat seen in her system was most likely of chemical nature.

Prof. Jirohta Kasagi (Tohoku University) presented "Low Energy ^{6}Li+d Reaction with Liquid Li Target: Screening Effects Due to Electrons and Ions." He and Takahashi showed photographs of the destruction which occurred as a result of the March 11 tsunami in Japan.

Prof. Peter Hagelstein (MIT) presented "Progress in Modeling Excess Heat in the Fleischmann-Pons Experiment" and began by stating that although his donor-acceptor model explained the multi-step process necessary for the energy source in the PdD_x system to exchange with the lattice, the subdivision of this large quantum to many receivers suffered from requiring strong coupling and long lifetime and both cannot be true. After reviewing data from both Karabut (X-rays) and Gozzi (gamma rays), he could manage a 2-level receiver model. He considers this to be an idealization of a more complicated model, which is under development.

Prof. Fulvio Frisone (University of Catania) described his model of microcracks in the cubic lattice while varying temperature. These cracks increase the tunneling effect, allowing for anomalous nuclear effects. Frisone concluded that the probability of tunneling increases with temperature raised to the fourth power.

The focus of the second topic area of the symposium was "Excess Heat/Power Calorimetry and Nuclear Particle Production."

Dr. Mitchell Swartz (JET Energy Inc.) gave two presentations on ZrO_2(PdNiD) nanostructured materials. These materials contain deuterated metallic PdNi core islands electrically isolated by a zirconia (ZrO_2) dielectric. The D loading is very high (up to ~3) and the material exhibits complex, possibly Zener-type, electrical avalanche breakdown behavior. Several nanostructured ZrO_2(PdNiD)-containing LANR devices (NANORs) were constructed and interrogated by electric, magnetic and ultrasonic fields using 4-terminal conduction measurements and calorimetry. Swartz reported that NANORs in a LANR transistor configuration, driven by two applied electric field intensities, demonstrate LANR heat associated with low level near-infrared emission, controlled by two optimal operating point manifolds.

Dr. Michael McKubre (SRI International) discussed the different modes of heat production resulting from the Fleischmann-Pons Effect. Heat mode A applies to bulk Pd. Heat occurs when the D/Pd ratio in a cathode is maintained above a threshold value for a period of time that is long compared with the deuterium diffusional time-constant. The observed excess power increases approximately linearly with cathode current density (above a non-zero threshold), approximately parabolically with D/Pd loading above threshold, and is responsive to deuterium flux. The amount of excess heat is typically 5-50% above the input power. Heat mode B applies to thin Pd foils and wires. Shorter initiation (on the time-scale of deuterium diffusion) times are required to stimulate excess heat production. This effect occurs at lower current thresholds, giving rise to sometimes very large power and energy gains (thermal output/electrical input).

However, excess heat may not increase significantly with increasing cathodic current. Deuterium flux may be important. Heat mode C refers to the continuation of excess power after cessation of all external power.

Dr. Mel Miles reported on a re-analysis of the MIT heat conduction calorimetry that was done in 1990. He concluded that the design of the MIT calorimeter was poor. The major finding was that the MIT calorimetric cell was so well insulated with glass wool (2.5 cm in thickness) that the major heat transport pathway was out of the cell top rather than from the cell into the constant temperature water bath. It can be shown for the MIT calorimeter that 58% of the heat transport was through the cell top and 42% was from the cell into the water bath. In a second presentation, Miles reported on electrochemical co-deposition results for Pd, Ni, Ru and Re in light and heavy water. Earlier he reported that he saw excess heat for the Pd/D_2O system but not the Pd/H_2O system. To challenge allegations that the observed excess heat was the result of shuttle reactions, he extended his investigations to include Ni, Ru and Re. For these metals, no excess heat was observed in either heavy or light water.

Takahashi kindly presented the paper of Prof. Akira Kitamura (Kobe University), reporting on hydrogen gas absorption/adsorption characteristics of Pd/ZrO_2 and $Pd/Ni/ZrO_2$ nanopowders. Time-resolved measurements of Pd/ZrO_2 reveal the existence of sub-phases, 1a and 1b, and very large differential heat of hydrogen uptake, η~1.3(1.2) eV/D(H), for the 1a-phase. The Pd/Ni/ZrO2 sample, received from Brian Ahern of Vibronics Inc., gave anomalously large D(H)/M ratios exceeding 3.0 and the averaged value of η~0.61(0.55) eV/D(H). The Pd/ZrO_2 and Ahern supplied $Pd/Ni/ZrO_2$ samples gave η_D sometimes exceeding η_H several times in some time intervals, which might be of nuclear origin.

Nuclear particle and transmutation results in the second topic area were presented later in the day.

Prof. Richard Oriani (University of Minnesota) gave an overview of the experiments he has conducted using CR-39 detectors. He has been carrying out electrolysis in a U-shaped cell that separates the anodic and cathodic reactions. These experiments showed that nuclear particles can develop not only in the cathode compartment where hydrogen is evolved but also in the anode compartment where only oxygen is produced. His control experiments showed that the observed tracks were not due to chemical attack, impingement of gas bubbles or electrostatic charge. Sequential etching of the detectors revealed the presence of tracks deeper inside the plastic.

Dr. Pamela Boss and Larry Forsley (JWK International) reported on CR-39 results obtained using the Pd/D co-deposition process. Earlier Boss had reported observing triple tracks in CR-39 detectors. These triple tracks are diagnostic of the carbon shattering reaction. In her presentation, Boss compared optical and SEM imaging of DT neutron and Pd/D co-deposition generated triple tracks. The results showed the two imaging techniques were complimentary. Both imaging techniques showed that the DT neutron and co-deposition triple tracks were indistinguishable. In his presentation, Forsley summarized the earlier CR-39 results obtained using the Pd/D co-deposition protocol. He discussed the control experiments and showed the results of co-deposition done on a composite cathode in which half the cathode was bare Ni screen and the other half was Au-coated Ni screen. Earlier it was shown that no tracks had been observed for Pd/D co-deposition done on a bare Ni screen in the absence of an external field. However, Pd/D co-deposition done on Ag, Au and Pt wires resulted in tracks in CR-39. Using the composite cathode in which both sides were exposed to the same chemical environment at the same time, no tracks were observed on the bare Ni side of the cathode while tracks were seen on the Au-coated side. Forsley then discussed the three methods employed to analyze CR-39 detectors used in the SRI replication of the SPAWAR protocol. The first method was microscopic examination followed by automated scanning. The microscopic examination showed tracks with optical properties consistent with that observed for nuclear-generated tracks. The automated scanning of the front and back surfaces showed two populations of tracks consistent with those seen for high energy protons and neutrons. In Russia, the detectors underwent sequential etching analysis. These results showed tracks due to 3 MeV protons, 12 and 16 MeV alphas and 2.45 MeV neutrons. Zhou of NASA did a LET analysis of the scanned data and concluded that the tracks were due to >10 MeV protons and low to high energy alphas.

Rick Cantwell reported on Coolescence's attempts to replicate the SPAWAR results. They saw similar CR-39 pits using both *in situ* CR-39 and Mylar-protected CR-39. However, CR-39 protected by a combination of Mylar and a small air gap did not show any pits. They concluded that this damage, together with the absence of pits when a small air gap is added to the Mylar protection, was the result of chemical reactions.

Matthias Grabiak (Quantum Rabbit LLC) did carbon arc experiments. ICP-MS analysis showed the presence of Si, Mg, Fe, Cu and Al.

The final topic area of the symposium was "New Energy Perspectives," which involved two papers directly related to LENR (cold fusion) and four papers on other energy concepts, such as the Open Gate Phenomena, Van der Waals force manipulation, magneto acoustic resonance and quantum field energy.

The Open Gate Phenomena presented by Susan Taft discussed negative binding energy shifts for small particle (1 to 10μ) of rhodium (Rh) and other Group (VIII) metals on titanium oxide (TiO_2). The Open Gate Phenomena is a solid-state effect that results in significant and sustained electron transfer from a n-type semiconductor to Schottky metal particles that are grown from the semiconductor itself. The metal particle acquires a negative charge in the process. This mechanism may provide cathodic protection of the metal and increased tolerance against poisoning of electrocatalysts and sensors and perhaps even a new way to generate electricity. PowerPoint slides related to this presentation are available at http://www.theopengate.net/acs_presentation.pdf.

Dr. Fabrizio Pinto's (Interstellar Technologies) presentation was titled "Van der Waals Force Manipulation in Semiconducting Nanocavities as a Novel Approach to Efficient Multi-source Energy Harvesting." This concept involves the Casimir force and the concept of zero-point energy. Pinto was born and raised in Rome, Italy but has worked extensively in the U.S. and is known for quantum vacuum engineering.

Dr. Thorsten Ludwig (German Association for Space Energy) presented two papers. The first was titled

"Experimental Investigation of a New Energy Technology Using Magneto Acoustic Resonance and Magnetic Force Microscopy." This discussion involved the 1920s work of Hans Coler using six magnets with coils arranged in a hexagonal shape that reportedly produced electrical energy without a power source. This was tested at the University of Berlin in 1926, but documents about these tests were destroyed during the war in 1943 by British fire bombs. The normal Atomic Force Microscope (ATM) was converted to a Magnetic Force Microscope (MFM) by using a chromium-cobalt coating on the tip of the probe and was used to investigate iron samples.

Ludwig's second related paper was titled "Using Quantum Field Energy and Magnetic Properties for Energy Conversion." It was speculated that the observed energy production came from "Raumenergie" (space energy) and relates to zero-point energy. The Coler device could not be set to function as described in the British intelligence reports and there was no clear mechanism on how quantum field fluctuations supply this energy.

Dr. Francis Tanzella reported on progress in "Helium and Energy Measurements from Exploding PdD_x wires at 77°K." These studies use a thin palladium wire and an applied axial voltage similar to the Celani and Tripodi experiments. The studies are done in liquid nitrogen at 77°K, and the heat produced is related to the amount of liquid nitrogen that is converted into gaseous nitrogen. Only small, safe samples of palladium are used because of possibility of explosive release of deuterium fusion energy. A large pulse of current (10 A) causes the thin Pd wire to either break at a weak point or to disintegrate ("explode"). This calorimetry gives an accuracy of about 0.06 J and excess energies as large as 1.26 J have been measured. Excess energy in every experiment was observed when palladium was co-deposited onto the thin palladium wire. Co-deposited PdD_x on top of a PdD_x wire yielded greater excess energy than the same deposit on a pure Ag wire. Measurements of helium-3 and helium-4 are planned for future experiments.

Roger Stringham gave the last presentation of this morning session, titled "Bose Einstein Condensate Cluster, High Density and T_c: Picosecond Heat Production." Although Bose Einstein Condensates (BEC) are normally produced in ultra-cold environments, the bare proton-neutron BEC of the deuterium nucleus can have an extremely high critical temperature (T_c). Sonofusion experiments at 20 MHz produced up to 38 watts of excess power with an input of 2 to 16 watts of acoustic power. Helium-4 injected into the circulating D_2O was also measured.

In all, the sessions were quite useful and well attended (up to 40 persons in each session). Everybody present looks forward to the next New Energy Technology Symposium in 2012.