Composition measurements and Imagery of Nanoparticle gas loading experiments as an investigation of LENR reactions

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A key issue for the development of a LENR power unit concerns the changes in nanoparticles during runs. LENUCO LLC is working on such power units and this work on nanoparticle changes is being done in support of that effort. [1] Our experiments have used pressurization of various different nanoparticle alloys with either deuterium or hydrogen. [2] The principal elements in the nanoparticle alloys are Nickel, Palladium and Zirconium with different percentage compositions [2]. We will present the results obtained from study of surface aspects and composition changes in the nanoparticles following runs by two techniques, SEM and SIMS, respectively. The results reported here are from various run times including an extended run that accumulated 40 hours run time.

Until now, both techniques have revealed some important facts. The SEM technique has pointed out a significant average increase in the nanoparticle surface roughness, depending on run time. We also have seen an agglomeration of the particles, mainly in the deuterium pressurized Palladium - Zirconium alloys. Possible explanations for the agglomeration will be discussed, including both physical and magnetic phenomena.

The SIMS runs employ a high resolution time of flight SIMS unit the employs gold ion bombardment. The objective is to obtain information about the elementary composition of the particles, before and after runs of the different alloys. Using the SIMS unit requires mounting the nanoparticles on a carbon tape. So far, the SIMS technique has revealed various elements in post-run particle that are not present in the unused nanoparticles. However, before asserting the creation of any elements due to LENR related reactions, we are in the process of determining the extent of possible contamination in these nanoparticles due to the experimental procedures, e.g. from components in the pressurization system during high temperature operation.

Our poster will present results of our imaging to highlight the differences in composition and surface of the nanoparticles after the experimental pressurization of various nanoparticles with hydrogen/deuterium. We will also address the possible implications of LENR reactions relative to the development of a practical power unit.

[1] G. H. Miley, et al., "A Distributed Power Source Using Low Energy Nuclear Reactions", submitted this conference.

[2] Tapan Patel, et al., "Heat generation from Hydrogen/Deuterium Pressurization of Nanoparticles: Composition and Temperature effect on Heat Output", submitted, this conference.