Heat Generation From H_2/D_2 Pressurization of Nanoparticles: Simulation of the Experiments on COMSOL Multiphysics®

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Abstract

The main issue for the development of a LENR power unit is concerned with the measurement and energy output of the reaction. Our team is currently working on a gas loaded nanoparticle-type cluster power unit [1,2] which pressurizes various nanoparticle alloys with either deuterium or hydrogen. The principal elements in the various nanoparticle alloys are Nickel, Palladium and Zirconium, with each alloy containing different percentages of elements.

The research is currently focused on determining excess energy output which can be attributed to LENR reactions [2]. Due to the current experimental setup, only the exterior temperatures of the reactor chamber are routinely measured during the experiments. In one chamber however, a center line temperature can be monitored. As seen in Figure 1, the initial peaks in temperature during the pressurization show significant power production. Using the exterior temperature data to determine an accurate evaluation of energy output is complicated. The complexity results from the various heat transfer interactions between the reactor, piping, insulation and natural convection.

Therefore, a COMSOL Multiphysics® model of the whole apparatus has been created in order to simulate the loadings. Figure 2 shows the final geometrical model at an early time of a reference cooling simulation. This reference cooling simulation will be compared to actual cooling data to ensure that the model is accurate. Then for pressurization experiments, the LENR input power in the model will be varied to match the actual external temperatures. This match will then provide a measure of the actual LENR power produced in the experiment. Our team is also working on improving the rapidity of the simulation process which is currently time consuming. When the various pressurization experiments are reproduced on the software, the model will also allow the team to determine any correlations between powder composition, gas type and heat output.

Our poster will present data on the process used to create the reference cooling curves. Then we will discuss the results of the simulations and explain the reliability of the values of power and energy production that are predicted. We will then conclude by comparing the different nanoparticle composition effects.

Reference

[1] Miley, G. (2013, July). Distributed power source using LENRs. Presentation delivered at International Conference on Cold Fusion 18, University of Missouri, Columbia
[2] Patel, T., et. Al. (2013, July). Recent results from gas loaded nanoparticle-type cluster power units. International Conference on Cold Fusion 18, University of Missouri, Columbia

Figures used in the abstract

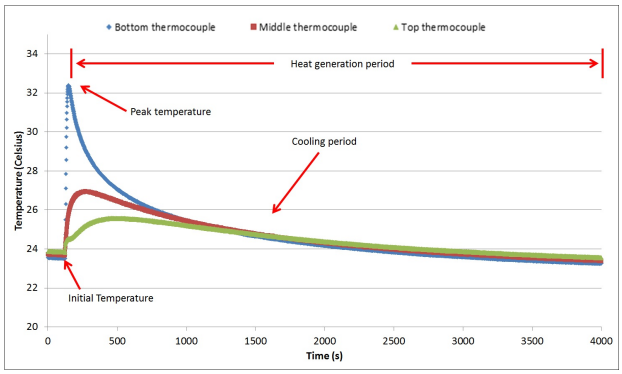

Figure 1: Typical temperature vs. time graph during pressurization.

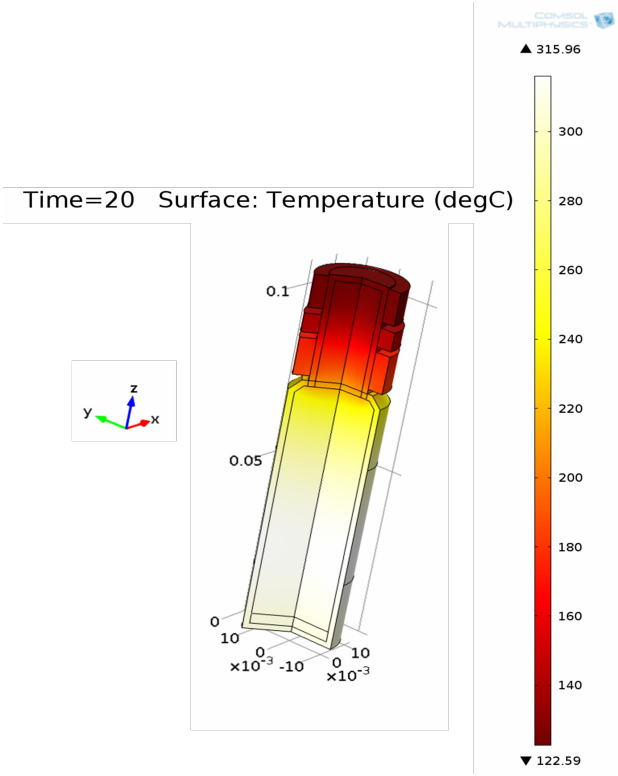

Figure 2: Geometrical model of the chamber.