Public Abstract

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Graduation Term:SP 2017
Department:Electrical Engineering
Degree:PhD

Title:INSTABILITY IN A PALLADIUM HYDRIDE SYSTEM DUE TO A FAST ELECTRICAL PERTURBATION CAUSED BY A PULSED POWER SYSTEM

Nanoporous palladium with a specific surface area of 29.12 m2 g-1 was created using highly loaded palladium hydride wires subjected to a fast electrical pulse of energy. The delivered energy of approximately 0.5 J was insufficient to melt unloaded palladium wires, but in contrast, caused highly loaded palladium hydride wires to disintegrate. An element such as palladium, which was studied in these experiments, has the capacity to store hydrogen and deuterium to extremely high concentrations. Additionally, electrical explosion experiments of palladium hydride wires were performed on single samples at the loading ratios ranging from 0.5 up to 0.96, approaching the highest experimentally achieved loading ratio of 1. It was found that nanoporous palladium was created by the pulsing of palladium hydride wires at loading ratios higher than the threshold of 0.6. Each additional increase in the hydrogen loading ratio caused an accompanying increase in the surface area. In contrast, when the hydrogen loading ratio was below 0.6 the wire remained intact and there was no nanoporosity produced. Finally, a novel calorimetry technique was used to determine the relative amount of energy released from a wire during a fast, low energy pulse. Statistical analysis using Dunnett's T3 test with a significance level of 0.05 was performed on the experimental data, and showed a statistical difference between the means of the control (i.e. unloaded palladium wires) when compared to PdH0.72 and PdH0.9, and a statistical difference when comparing the control mean to PdD0.5 and PdD0.87.