Anomalous Heat Effects Induced by Metal Nanocomposites and Hydrogen Gas

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Collaborative research between Technova Inc., Nissan Motor Co. Ltd., Kobe Univ., Kyushu Univ., Nagoya Univ. and Tohoku Univ. had been performed for two years, which started in October 2015. In this collaboration work, a new highly accurate oil mass-flow calorimetry system was developed at Tohoku University [1] to replicate anomalous heat generation experiments reported by A. Kitamura and A. Takahashi et al [2]. This system was designed to improve the performance of the already existing flow calorimetry system at Kobe University.

In this paper, we describe evidence of anomalous heat effects mainly obtained from experiments at our laboratory in Tohoku University. Excess energy experiments were done using nano-sized metal composite with H_2 or D_2 gas. Main results at our laboratory are as follows.

1) Experiments using CNZ($Cu_1Ni_7Zr_{15}$-O_x) with H_2, PNZ($Pd_1Ni_7Zr_{15}$-O_x) with D_2, CNS (Cu_1Ni_{10}/SiO2) with H_2 and PSn1(Pd/SiO2) with D_2 were performed. Anomalous excess heat generations were observed for all the samples at elevated temperature (150℃-350℃), except for the Pd nanoparticles embedded in mesoporous SiO_2 (PSn1).
2) The amount of anomalous heat generation per hydrogen atom ranged from 10eV/H or D to 100eV/H or D. Note that these values were obtained using the number of hydrogen atoms absorbed into the metal; not the number of consumed hydrogen atoms.
3) The released energy is very difficult to explain by known chemical processes only.
4) Coincident burst-like increase events of the pressure of reaction chamber and gas temperature, which suggested sudden energy releases in the reaction chamber, were observed many times for an experiment using the CNZ type sample with H_2 gas.
5) These burst-like events were replicated during the experiment using the same CNZ type sample.
6) Excess heat experiments using the same material at Kobe and Tohoku Universities showed similar experimental results. Qualitative reproducibility between Kobe and Tohoku experiments was good.

References

[1] Y. Iwamura et.al, J. Condensed Matter Nucl. Sci., Vol. 24, pp.191–201, 2017.
[2] A. Kitamura and A. Takahashi et. al, Current Science, Vol. 108, no. 4, pp. 589-593, 2015.