Search for γ–ray radiation in NiCuZr nano-metals and H_2 gas system generating large excess heat

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Much work on anomalous excess heat generation in the Ni-H system has been made since the early days of Cold Fusion study, which began with Pd-D system by heavy water and Pd electrode. Recent studies including our cooperative experiments [1,2] have made it clear that hydrogen gas absorption (or discharge) by Ni-containing complex nano-metals produces large thermal energy far beyond that of chemical reaction. However, the origin of this excess heat generation has not been known, yet. Focardi et al. reported some radiations from the Ni-H system including a discrete γ-ray emission as evidence on nuclear reaction [3]. In the present work, we have searched for γ-ray emissions from our system possibly focusing on the Ni + p reaction.

Gamma rays were detected in parallel with precise measurement of heat generation from our system using H_2 gas and CNZ6s sample (the sample with CuNiZr composition ratio same as CNZ5s reported in [1]): averaged excess power was about 2.1 W and total thermal energy 5.3 MJ/mol-H. A Ge detector (ORTEC) was placed outside the wall of chamber with its front face at 5 cm from the wall and γ rays up to 2.7 MeV were measured.

Figure 1 shows examples of the measured γ-ray spectra. The upper one corresponds to the background measurement and the lower one to the foreground during the heat generation. In the case of 1 MeV energy release by a reaction, its reaction rate should be 6.24×10^{12} reactions/sec for 1 W output. Counting rates (Counts/sec) of prominent peaks in the BG spectrum are 0.253 (609 keV; ^{214}Bi), 0.18 (1461 keV; ^{40}K) and 0.047 (2614 keV; ^{208}Tl); far below the reaction rate of 1 W. Thus, if discrete γ rays were released in a reaction generating the heat, they should be observed with good statistics.

In Fig. 1, there are many discrete γ rays in the lower spectrum, as you can see. However, all the γ-ray peaks agree with those seen in the BG spectrum. Thus the comparison of the spectra simply indicates that no discrete γ rays are emitted in the reaction which produces anomalous excess heat.

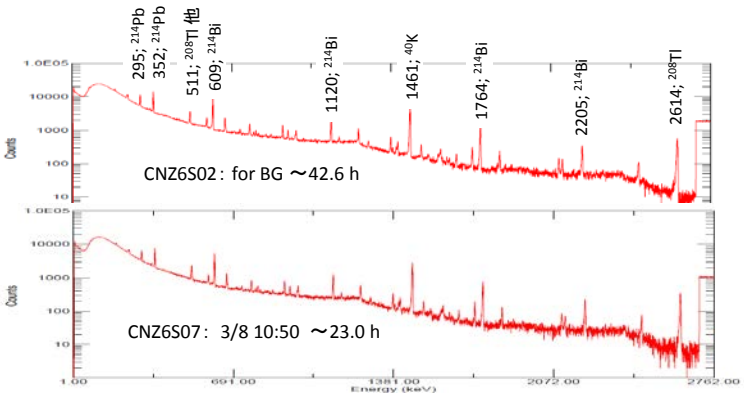

Fig. 1. Gamma-ray spectra for background (upper) and foreground (lower).

We will report the results based on a more detailed analysis, and discuss on possible reactions in the NiCuZr composite nano-metals with H_2 gas.

[1] Y. Iwamura et al., J. Condensed Matt. Nucl. Sci., 24 (2017) 191.
[2] A. Kitamura et al., *ibid.*, 202.
[3] S. Focardi et al., in Proc. of "ASTI Workshop" (1999); Nouv. Cim. 112A (1999) 921.