Temperature and pressure dependence of anomalous heat generation occurring in hydrogen gas absorption by metal powder

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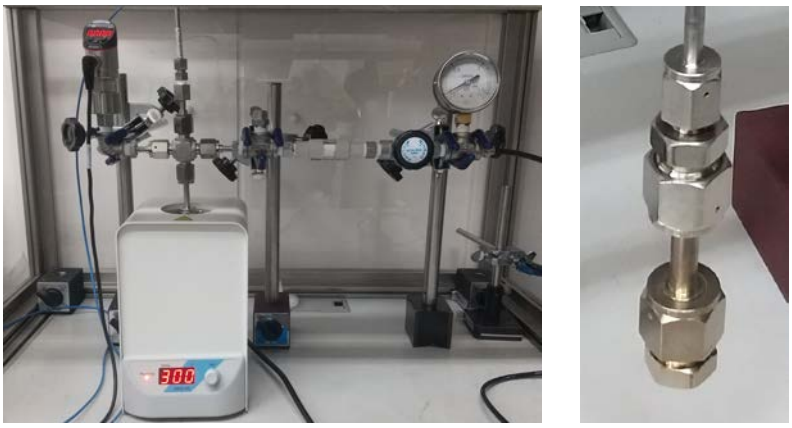
It is known that anomalous heat is generated when hydrogen (or deuterium) gas is absorbed by nickel or palladium powder [1-2]. There are lots of researches while increasing either initial temperature or pressure in reaction chamber. In our previous report [3], we developed a small constant-volume reaction system (shown in Fig. 1) in order to validate excess heat generation, while increasing both of pressure and temperature simultaneously. This is because only temperature increase may lead to less reaction due to the possibility that hydrogen gas heated gets out of metal powder such as palladium or nickel.

In this report, we conduct fundamental experiment of hydrogen gas absorption, up to 300 ℃ and 0.5 MPa. Sample (nickel powder or Pd-Ni-Zr composite powder) absorbs loaded hydrogen gas, after evacuation and preheating. Temperature changing of the sample is measured by K-type thermo couple. As a result, temperature rise of about 4 K is observed in the experiment conducted for nickel powder, while that of about 12 K for Pd-Ni-Zr composite powder is obtained. Emphasis is placed on the fact that temperature rise is assisted by not only preheating but also gas absorption under higher pressure. Obtained experimental results brings an insight on quantitative evaluation of correlation between output of temperature increase after reaction and input parameters such as preheat and loading gas pressure of hydrogen gas. This will also be important as basic database for the focusing compression engine proposed by us [4].



a) overall view b) reaction chamber

Fig. 1. Reaction system

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