

NEW HIGH-PRESSURE AND HIGH-TEMPERATURE XRD SAMPLE STAGE FOR IN-SITU STUDIES OF SOLID-GAS INTERACTIONS

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A new high-pressure/high-temperature XRD sample heating stage for X-ray studies of solid-gas interactions up to 100 bar gas pressure and 900 °C is presented. Many reactive gases including hydrogen can be used, which makes the instrument suited for a wide range of applications, for example in fuel cell research and catalysis. The sample stage is CE/UL certified and provides easy operation at a high safety level.

The poster describes the design and performance of the new high-pressure stage and presents first application measurements on Nd₂Fe₁₄B sample powders. Nd₂Fe₁₄B is a well-known permanent magnetic material. The magnetic characteristics can be improved by using a so-called HDDR (**h**ydrogen **d**isproportionation **d**esorption **r**ecombination) method.

The disproportionation of Nd₂FeB under different hydrogen pressures could be observed directly by using the *in situ* HTXRD attachment. The annealing under hydrogen leads to a phase decomposition into αFe, NdH₂ and Fe₂B at higher temperatures in dependence on the hydrogen pressure. Furthermore, the influence of different hydrogen pressures on possible additional phase transformations can be detected and identified directly by using the presented high-pressure/high-temperature XRD chamber.

After the hydrogen desorption and the recombination of the Nd₂Fe₁₄B phase a fine-grained microstructure is achieved, which is coupled with an improvement of the magnetic coercivity.