

## Project HC-3: Structural characterization of hydrogen storage materials

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### Background

Neutron diffraction is very important method for structural studies of hydrogen storage materials, since it is the only method to determine the location of hydrogen in the metal lattice. The JEEP II reactor at Kjeller with the high-resolution powder neutron diffractometer PUS is a unique tool in that respect. In addition, we are using X-ray diffraction, and in particular synchrotron X-rays. The combination neutron – X-rays is in particular important for these studies. During the last 2 – 2.5 years we have focussed our research on studies of alanates. We have a well-established collaboration with C. M. Jensen at University of Hawaii (Project H-11) and D. Anton from United Technologies Research Center (Project H-13).

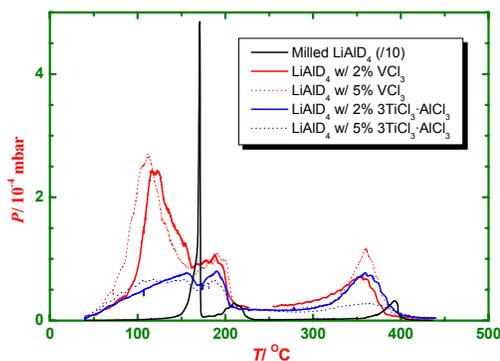
### Status of December 2003

During the last year we have been working on:

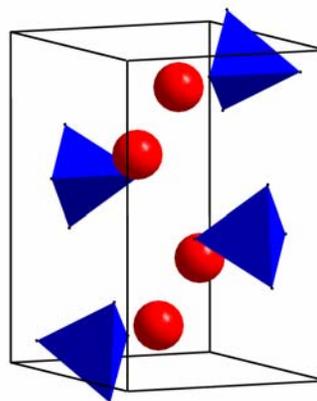
- The effect of additives for the  $\text{LiAlH}_4$ -system. Different V- and Ti-based additives have been studied, and it both give a significant reduction of the desorption temperature.
- Careful diffraction studies (both synchrotron X-ray and neutrons) of  $\text{NaAlH}_4$  with different additives and additives added to  $\text{NaAlH}_4$ ,  $\text{Na}_3\text{AlH}_6$  and  $\text{NaH}+\text{Al}$ . The results show no indications of solid solution. However, a crystalline  $\text{Al}_{1-x}\text{Ti}_x$  phase seems to appear during cycling.
- Structural studies of the  $\text{KAID}_4$  by neutron diffraction.

### Activities in 2004

The plan is to continue to work on the systems described above. The focus will be both to understand more about the effect of additives and to learn more about the desorption processes. We will also focus on synthesis of new complex hydrides.



Thermal desorption spectroscopy of  $\text{LiAlD}_4$  without and with additives.



The structure of  $\text{KAID}_4$