

Microscopic indicator for thermodynamic stability of hydrogen storage materials provided by muon-spin spectroscopy

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In search of a high-capacity hydrogen storage system, we have investigated the thermodynamic properties of borohydrides $[M(\text{BH}_4)_2]$. Using muon-spin rotation and relaxation (μSR), we have acquired data for five different powder samples below ambient temperature. Zero-field μSR measurements indicate the formation of the H-muon-H system in LiBH_4 , NaBH_4 , KBH_4 , and $\text{Ca}(\text{BH}_4)_2$ but not in $\text{Mg}(\text{BH}_4)_2$. It is also found that the amplitude of the H-muon-H signal (A) varies with the electronegativity (χ) of Mn. Since the thermodynamic stability of $M(\text{BH}_4)_n$ also depends on χ , the amplitude (A) is thought to be a microscopic indicator for the stability of the $M(\text{BH}_4)_n$ unit. Consequently, we can present μSR as a novel tool for investigating similar hydrogen storage materials [1].

REFERENCES

[1] J. Sugiyama, M. Mansson et al., Physical Review B, 81, 092103 (2010)

Primary author: Dr MANSSON, Martin (Laboratory for Quantum Magnetism (LQM), EPF Lausanne)

Co-authors: Prof. ANSALDO, Eduardo J. (TRIUMF, Vancouver, Canada); Prof. BREWER, Jess H. (TRIUMF, UBC, Vancouver, Canada); Dr SUGIYAMA, Jun (Toyota Central Research and Developments Laboratories, Japan); Dr MIWA, Kazutoshi (Toyota Central Research and Development Laboratories, Japan); Prof. CHOW, Kim H. (University of Alberta, Canada); Dr OFER, Oren (TRIUMF, Vancouver, Canada); Dr TOWATA, Shin-ichi (Toyota Central Research and Development Laboratories, Japa); Dr GOKO, Tatsuo (TRIUMF, Vancouver, Canada); Dr NORITAKE, Tatsuo (Toyota Central Research and Development Laboratories, Japan); Dr IKEDO, Yutaka (KEK, Japan)

Presenter: Dr MANSSON, Martin (Laboratory for Quantum Magnetism (LQM), EPF Lausanne)

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