

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 $[M(BH_4)_2]$. Using muon-spin rotation and relaxation (μ SR), we have acquired data for five different powder samples below ambient temperature. Zero-field μ SR measurements indicate the formation of the H-muon-H system in $LiBH_4$, $NaBH_4$, KBH_4 , and $Ca(BH_4)_2$ but not in $Mg(BH_4)_2$. It is also found that the amplitude of the H-muon-H signal (A) varies with the electronegativity (χ) of M . Since the thermodynamic stability of $M(BH_4)_n$ also depends on χ , the amplitude (A) is thought to be a microscopic indicator for the stability of the $M(BH_4)_n$ unit. Consequently, we can present μ SR 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)

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