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NMR Investigations of YMn_2H_x Hydrides*

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The YMn_2H_x hydrides with $x = 1, 2, 3$ were investigated by ^{55}Mn NMR spin echo measurements at atmospheric and high pressure. Resonance lines at frequencies up to 440 MHz were observed for the hydrides, corresponding to a huge increase of the hyperfine fields at those Mn with hydrogen neighbours. At high pressure the initial decrease of the magnitude of the Mn hyperfine field of YMn_2H_1 at 4.2 K was found to be 4% per kbar which is an order of magnitude bigger than observed in the other magnetically ordered materials. The effects are interpreted in terms of changes of the orbital contribution and valence electron contribution to the hyperfine field caused by hydrogenation and the influence of the external pressure.

1. Introduction

The compounds of rare earth elements with manganese exhibit a variety of magnetic properties and structures. Many of these compounds absorb hydrogen very easily [1], which introduces changes to their magnetic properties. Among these compounds the simplest structure is that of the $REMn_2$ compounds, which crystallise in the cubic C-15 (*Fd3m*) structure. To focus on the magnetic interactions of only the manganese atoms in this structure, the compounds with nonmagnetic Rare Earth elements or yttrium compounds are investigated. The YMn_2 compound, in spite of its simple crystallographic structure, below 100 K orders in a very complicated antiferromagnetic structure with equal magnetic moments of manganese atoms, which yield an effective zero net magnetisation [2]. In addition its cubic structure undergoes tetragonal or trigonal distortion at low temperatures.

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