9.7 cm

^{57}Fe- AND ^{155}Gd- MÖSSBAUER EFFECT STUDY OF $GdFe_2$ HYDRIDES

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^{57}Fe- and ^{155}Gd- Mössbauer effect was applied to study the electronic and magnetic properties of $GdFe_2H_x$ ($0 \leq x \leq 3.1$). Samples with hydrogen content up to x = 2.9 are found to preserve the C15 cubic structure of $GdFe_2$, while a rhombohedral distortion is observed for larger x. The lattice volume expansion follows a linear dependence with 8% relative volume increase per hydrogen atom and f.u. $GdFe_2$. The hydrogen induced structural and electronic modifications are reflected by drastic changes in hyperfine interaction parameters. The local changes caused by hydrogen atoms were estimated at Fe nuclei for the compound with low hydrogen concentration; decrease of the magnetic hyperfine field and increase of the isomer shift is observed due to the presence of a single hydrogen atom in the neighbourhood of iron. Most probably the changes of global character dominate in the region of high hydrogen concentration and are mainly responsible for the increase of iron hyperfine interactions. A reduction of the ^{155}Gd magnetic hyperfine fields on the hydrogen content is found, possibly connected with a weakening of the exchange interactions of the Gd ion with the iron sublattice due to electron charge transfer towards hydrogen. It is found that the increase of the ^{155}Gd isomer shift is about five times more influenced by electronic effects (decrease in conduction electron density) than by the volume increase. The electronic modifications are stronger at the Gd site than at the Fe-sublattice, where the electronic changes are estimated to be about 2.5 times larger than the ones arising from the volume expansion.

13.4 cm

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