EXCHANGE INTERACTIONS IN HYDROGEN-INDUCED AMORPHOUS YFe_2

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Although rapid quenching is commonly used in preparation of amorphous alloys, hydrogenation of intermetallic compounds could also lead to the formation of an amorphous phase. We have demonstrated that such hydrogen-induced amorphization takes place in the C15 Laves phase YFe_2. The hydrogen-induced amorphous (HIA) $YFe_2(H)$ alloy is a good ferromagnet at room temperature while amorphous YFe_2 prepared by conventional vapour-quenching is known to show a paramagnetic to spin-glass transition at ~ 50 K. It has been found in our previous investigation that the exchange integral estimated from the temperature dependence of the mean ^{57}Fe hyperfine field is reduced clearly by reducing the hydrogen content in the HIA-$YFe_2(H)$ alloy, suggesting the effect of volume on the exchange interactions. In this study we have employed the electron diffraction radial distribution analysis of HIA-$YFe_2(H)$, in order to clarify the volume change induced by hydrogen. The strong positive exchange interaction in HIA-$YFe_2(H)$ is well understood by the effect of hydrogen on the interatomic separation between the nearest neighbor Fe atoms.