Direct Measurement of the Hydrogen-Hydrogen Correlations in Hydrogenated Amorphous $Ni_{56}Dy_{44}$ by Neutron Diffraction

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From an isotopic mixture of dysprosium with zero neutron scattering length and an isotopic mixture of nickel with zero neutron scattering length ribbons of the amorphous alloy $Ni_{56}Dy_{44}$ were produced by melt-spinning and loaded with 59 at% deuterium. A neutron diffraction experiment yielded directly the deuterium-deuterium partial structure factor S_{DD} and the partial pair correlation function G_{DD}. The incorporation of the D-atoms into the amorphous matrix shows an ordering up to five coordination shells at least. The main peak of G_{DD} is split up into a contribution at 2.36 Å with 5.4 nearest neighbours and a contribution at 2.76Å with 4 neighbours. The D-atoms are located preferentially in Dy_4-tetrahedra, where the occupation of two neighbouring face-sharing tetrahedra is avoided.

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