# (FeAl)-substitution effect in $DyMn_{6-x}Ge_{6-x}Fe_xAl_x$ ($0 \leq x \leq 6$) compounds

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The compounds containing rare earth elements, metals and other metals or metalloids have attracted great attention in recent years. The object of our interest is a series of alloys with the general formula $DyMn_{6-x}Ge_{6-x}Fe_xAl_x$ ($0 \leq x \leq 6$). There are two parental compounds, $DyFe_6Al_6$ and $DyMn_6Ge_6$ (for x=6 and x=0, respectively) whose crystal structure, magnetic structure and other properties (*e.g.* magnetic, transport) are well known. $DyFe_6Al_6$ is a ferrimagnet and crystallises in a partially disordered tetragonal $CeMn_4Al_8$-type structure (space group I4/mmm) [1, 2 and references therein]. The second parental composition, $DyMn_6Ge_6$ is a helimagnet with a hexagonal $HfFe_6Ge_6$-type structure (space group P6/mmm) [3 and references therein]. This compound shows a complex incommensurate magnetic order. There is a transition at 80-100 K, from a triple flat spiral to a triple conical spiral below this temperature [4, 5]. As mentioned above, these two intermetallic compounds have different crystal and magnetic structures. With (FeAl)-substitution we have expected destruction of the structural stability, which has prompted us to examine the possibility of amorphous phase formation in this group of alloys. We report results of their study by X-ray diffraction (XRD), differential scanning calorimetry (DSC), transmission electron microscopy (TEM) and magnetic measurements (SQUID). Starting from $DyMn_6Ge_6$ compound, (FeAl)-substitution leads to destabilization of its crystal structure. For the composition with $1 \leq x \leq 2.5$, an amorphous halo in the X-ray diffraction experiment was observed. For alloys with higher FeAl content, a tetragonal phase ($CeMn_4Al_8$-type), the same as in $DyFe_6Al_6$, was formed. The transmission electron microscopy was used to confirm the amorphous state. Magnetization *vs.* temperature and applied field curves for amorphous alloys show similar behaviour and similar effects as for parental compounds, where we observe, for example, a metamagnetic transition from helix to the fun structure.

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