COMPOSITION STRATIFICATION IN STRAINED EPITAXIAL GARNET FILMS

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9.7 cm

High-coercive garnet films (GF) can be effectively used in thermo-magnetic recording and creating micro-traps for ultracold neutral atoms such as ^{87}Rb. Because the optimal way to increase coercivity H_c is to make film-substrate lattices mismatch Δa, stresses occurred induce misfit dislocations and the facet GFs morphology is observed. The films non-uniformity can be enlarged technologically to create special types of micro-traps. It is possible due to the composition stratification in the GF; this effect is described in detail in the report. Mainly the films of $(Bi,Lu,Sm)_3(Fe,Ga,Al)_5O_{12}$ composition were investigated, however $(Y,Tm,Gd,Bi)_3(Fe,Ga)_5O_{12}$ and $(Y,Bi)_3(Fe,Ga)_5O_{12}$ systems were analyzed too. They were grown by LPE method on $Gd_3Ga_5O_{12}$ (111)-oriented monocrystalline substrates and characterized by $\Delta a = 0.074 - 0.103$ $\mathring{A}$, $H_c = 100 - 1000$ Oe and Curie temperature $T_c = 50 - 200$ °C. The films chemical composition distribution was investigated on SEM supplied by energy dispersion analysis (EDA). To prevent mistakes conditioned by the EDA penetrating depth (1-2 μm) only the GFs edges were analyzed. Layered films were synthesized. Significant differences in magnetic properties of their sub-layers were obtained. They are conditioned by the non-uniform distribution of garnet-forming elements occurred along the film crystallization front. Different T_c values in them allow to realize separate thermo-recording for creating through and non-through stable domain patterns and micro-traps on different levels above the GFs surface.

13.4 cm

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