

Superconducting heterostructure (FeCr_xFe)VFe: new view on old experiment

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Artificial layered systems FeCr_xFe and Fe_xVFe_x are well known due to the effects that discovered in these. First system demonstrates the oscillating coupling¹ of the iron layers with the thickness increasing of the chromium inter-layer and the effect of giant magneto-resistance at anti-ferromagnetic coupling of the iron layers. In the second system was observed the oscillations of the superconducting transition temperature (T_c) and the reentrant superconductivity² effect with the increasing of the iron layers thickness. Together with experiment² was performed an experiment³ on studying the influence of the mutual directions of magnetization of the iron layers on superconductivity of the vanadium layer: structures FeCr_xFe¹ and FeVFe² were combined into a single epitaxially grown structure MgO (001) - (FeCr_xFe)VFe. In next years other groups have performed experiments that confirmed the influence of the magnetization direction on T_c - so-called the effect of the spin valve for superconducting current. However in these experiments, the observed differences of the critical temperatures (ΔT_c) is much smaller ($\Delta T_c \sim 0.2$ K), than in the experiment with the superconducting heterostructure of FeCr_xFeVFe ($\Delta T_c \sim 2$ K). Present report is devoted to the analyze of a possible reasons for a too large value of ΔT_c .

¹G. Binasch, P. Grünberg et al. Phys. Rev.B, **39**, 4828 (1989)

²I. A. Garifullin, D. A. Tikhonov et al. Phys. Rev.B, **66**, 020505R (2002)

³Yu. V. Goryunov, arXiv:cond-mat/0305428 (2003)