$$\beta^2 = \omega^2 \cdot C \cdot L + \frac{1}{\mathrm{Im}(x)} \cdot \frac{d^2}{dx^2}\mathrm{Im}(x) \qquad (5)$$

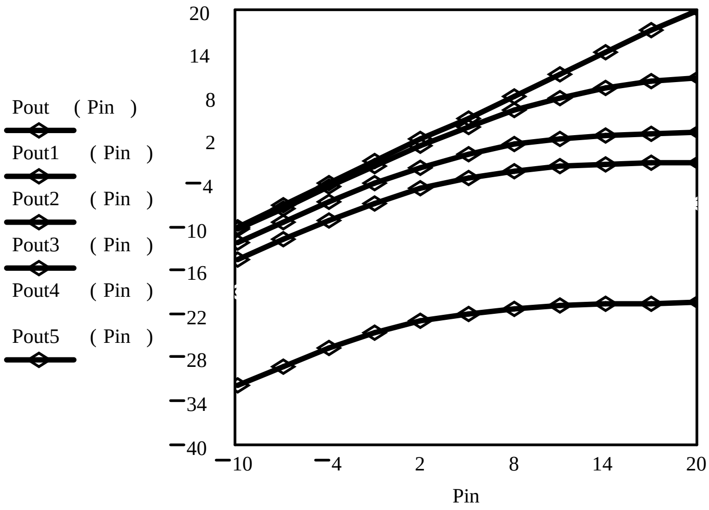

Рис. 1. Выходная мощность $P_{вых}$ как функция входной $P_{вх}$ мощности для части нелинейной линии передачи с дифференциальным коэффициентом передачи α

В настоящее время ведется работа по анализу влияния микроволновой мощности на β.

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COMBINED ANALYSIS OF THE DATA OF STATIC AND DYNAMIC MAGNETIC MEASUREMENTS AS METHOD OF MAGNETIC STATE STUDYING OF CoFeZr/Si MULTILAYER NANOSTRUCTURES

Last years magnetic nanostructures composed of ferromagnetic metal and semiconductor layers have attracted attention of researchers as promising material for spin electronics devices. These nanostructures may be used for elaboration of the spin field-effect transistors, as well may served as spin-polarized electrons sourses. During deposition of multilayer nanostructures containing Si layers the formation of mixed interface layers is observed. As result the ratio between the thicknesses of magnetic and nonmagnetic layers changes. It means that important applicable magnetoresistive characteristics of nanostructures may change too.

In the frame of studying this problem we have been investigated $(Co_{45}Fe_{45}Zr_{10}/Si)_{40}$ multilayers deposited by ion beam sputtering [1]. Integrated study of magnetic characteristics of nanostructures using static (vibrating sample magnetometer) and dynamic (ferromagnetic resonance) methods was carried out with the purpose to get information about nanostructure inner state.

The hysteresis loops and the mean saturation magnetization I_S^f were measured for samples with various ratio t_m/t_{Si} of thicknesses of magnetic layers (t_m = 1.5 – 3 nm) and nonmagnetic ones (t_{Si} = 0.5 – 5 nm). It was found that hysteresis loop parameters depended substantially on the layer thickness and I_S^f differed from the expected calculated values $I_S^f(calc)$ - see Fig.1.

From FMR spectra measured with static field applied parallel to the film plane the values of resonance fields H_{res} were determined. The effective magnetization values M_{eff} were calculated using the Kittel formula [2]:

$$¬_{res} = \frac{g \cdot «_B}{h} \sqrt{H_{res}(H_{res} + 4®M_{eff})},$$

where resonance frequency $¬_{res}$ = 9. 27 GHz, g-factor g = 2.15, h is the Plank’s constant, $«_B$ is the Bohr magneton.

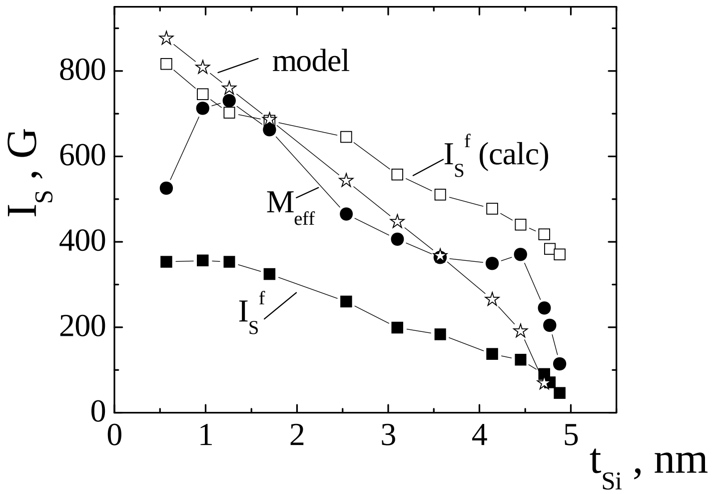

Fig. 1. Dependences of calculated and experimental values of saturation magnetization I_S versus silicon layer thickness t_{Si} for $(CoFeZr/Si)_{40}$ nanostructures

Using the values of magnetic moments measured by static method and effective magnetization data obtained from dynamic measurements we have estimated the real thicknesses of magnetic layers. It was found that decreasing of this thickness as compared to that assigned during sputtering occurs for the films with small content of silicon.

The model explaining the character of decreasing of magnetic layer saturation magnetization was proposed. It is based on formation of nonmagnetic silicides of metal. Within the framework of this model the magnetizations of structures with a various ratio of magnetic layer thickness to silicon layer one were calculated. The satisfactory coincidence with the results of experiment was shown.

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МЕХАНИЧЕСКИЕ СВОЙСТВА ОБЪЕМНОГО АМОРФНОГО СПЛАВА Zr-Al-Ni-Cu-Y ПРИ НИЗКИХ ТЕМПЕРАТУРАХ

Массивные аморфные сплавы, такие как Zr-Al-Ni-Cu, обладают рядом уникальных физических свойств, в том числе и механических – исключительно большой прочностью и высокой упругой деформацией. Однако практическое применение этих сплавов как конструкционных материалов сдерживается в настоящее время их ограниченной пластичностью в ходе деформации. Отсутствует также в достаточной степени информация о механических свойствах этих материалов при низких температурах. В связи с этим цель данной работы - исследование механических свойств аморфного сплава $(Zr_{0.55}Al_{0.1}Ni_{0.05}Cu_{0.30})_{0.99}Y_{0.01}$ в интервале температур 300 – 4,2К.

Исходный слиток указанного номинального состава (состав приведен в атомных долях) был приготовлен предварительным плавлением смеси чис-