МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
СУМСЬКИЙ ДЕРЖАВНИЙ УНІВЕРСИТЕТ
ФАКУЛЬТЕТ ІНОЗЕМНОЇ ФІЛОЛОГІЇ
ТА СОЦІАЛЬНИХ КОМУНІКАЦІЙ

# СОЦІАЛЬНО-ГУМАНІТАРНІ АСПЕКТИ РОЗВИТКУ СУЧАСНОГО СУСПІЛЬСТВА

МАТЕРІАЛИ ВСЕУКРАЇНСЬКОЇ НАУКОВОЇ КОНФЕРЕНЦІЇ ВИКЛАДАЧІВ, АСПІРАНТІВ, СПІВРОБІТНИКІВ ТА СТУДЕНТІВ

(Суми, 21-22 квітня 2016 року)

Суми
Сумський державний університет
2016

verification the electronic stopwatch and a single-phase wattmeter (accuracy class 0.1) were used.

The calculation of power, which is measured by meter, was performed according to the formula:

$$P = \frac{3600 \cdot n}{A \cdot t},$$

where n – the number of complete revolutions of the meters' disc; t – time shown by the stopwatch; A – ratio.

The research found that the tilts in the vertical plane up to 10° practically do not affect the readings of the metering device. With further deflection of the meters' posture (up to 30°), significant errors (up to –4,63 %) occur, which beyond the margin of error of electric energy metering device.

## FORMATION OF THE SENSING ELEMENT OF THE MAGNETIC FIELD SENSOR BASED ON CU AND CU


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To form the sensing elements of the magnetic field sensors based on magneto-resistance effect, it was suggested to use a method of layer condensation in vacuum Co and Cu with the thickness of individual layers from 1 to 20 nm and sequence depending on the functionality of the finished sensitive element. For high-speed digital sensors, it is reasonable to form multilayer nanostructures of a spin-valve "sandwich" type Co(4÷12nm)/Cu(4÷8 nm)/Co(20 nm)/S (S - substrate). Co magneto-rough lower layer is additionally secured by high temperature of substrate $T_S$ = 950 K which provides high values of lower layer coercitivity Co. The sensor element based on such a multilayer structure depending on the applied external magnetic field can be located in two states "high" and "low" value of resistance that can provide a stable state of logic "zero" and "unity."

For highly sensitive magnetic field sensors with linear operating dependencies of resistance from the applied magnetic field R(V) with the maximum value of resistance at B = 0 T, there can be used multilayer film systems on the basis of Co and Cu as multilayers $[Co(1 \div 3\ nm)/Cu(1 \div 3\ nm)]_x/S$ or a film system of granular solid solution (Cu, Co) obtained by simultaneous condensation or layered condensation of components with further termoannealing at 700 ÷ 900 K.

The study of the magnetic characteristics of the film samples in the form of spin-valve Co/Cu/Co/S fixed magnetic layer thickness of 20 nm Co (bottom) found out that the value of such systems MR at room temperature is between 0,1-0 2%.

A multilayer film system in the form of spin-valve Co/Cu/Co/S is advisable to modify using a multilayer as an upper magnetic layer on the basis of Co and Cu. This modification increases the value of the MR to values of 0.4%, slightly improves performance and improves temperature stability of the system.

A combination of both systems into a complex multi-layer film structures of spin-valve type, in which the top layer is replaced by a magneto-soft multilayer allows you to create a multifunction sensing element of the magnetic field sensor. Performance R (B) of the sensing element will have two maximums at B = 0 T and $B_k$ (coercive lower layer) that can ensure the stable operation of the logical element in the three logical states.

## METAMATERIALS AND THEIR APPLICATION IN MICROWAVE TECHNOLOGY

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Metamaterial is a composite material whose properties are not so much caused by the properties of its constituent elements as artificial periodic structure of macroscopic elements having arbitrary size and shape.

Artificial periodic structure within the metamaterial modifies its dielectric and magnetic permeability, which allows to control the laws of dispersion, reflection and refraction electromagnetic waves in metamaterials.

Theoretical and experimental research and technical metamaterials applications cover a wide range of frequencies from radio waves to visible light range. The developer has the choice of metamaterials various free parameters (size of the structure, form, constant and variable period of array elements that make up the structure). One possible properties of metamaterials is a negative factor refractive index, which is shown with simultaneous negative dielectric permittivity and magnetic permeability of the material [1].