

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



**СОЦІАЛЬНО-ГУМАНІТАРНІ  
АСПЕКТИ РОЗВИТКУ СУЧАСНОГО  
СУСПІЛЬСТВА**

**МАТЕРІАЛИ V ВСЕУКРАЇНСЬКОЇ НАУКОВОЇ КОНФЕРЕНЦІЇ СТУДЕНТІВ,  
АСПІРАНТІВ, ВИКЛАДАЧІВ ТА СПІВРОБІТНИКІВ**

**(Суми, 20-21 квітня 2017 року)**

**Суми  
2017**

resources, size and personnel loading, etc., identify missing and duplicate processes and make appropriate adjustments, define the functions of each unit, establish relationships between units and their functions.

## **INFLUENCE OF ANNEALING TEMPERATURE ON MAGNETORESISTANCE OF ULTRATHIN FE AND CO FILMS**

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Recently, studies of the structures with the spin-tunnel magnetoresistance effect attract a particular interest. The use of the elements based on tunnel magnetoresistance will allow to create new devices for spintronics, increase the recording density and the speed of information read-out.

The structures of tunnel magnetoresistance include ultrathin films of ferromagnetic metals and alloys. In such samples the features of magnetoresistance are caused by the presence of island structure.

The purpose of the study is to establish the influence of annealing temperature and size effects on the value of tunnel magnetoresistance of the island films of iron and cobalt.

As a result of experiments the single-layer Co and Fe films (1-30) nm thick were obtained in the vacuum chamber at the pressure of residual atmosphere  $10^{-4}$  Pa. The film condensation was carried out by evaporation of metals with purity not less than 99.98% using the electron-beam gun. The thickness was controlled by the quartz resonator method.

Measurements of the magnetoresistance and thermomagnetic treatment of the films were carried out in a special device under the conditions of ultrahigh oil-free vacuum ( $10^{-6} \div 10^{-7}$ ) Pa in the temperature range from 150 to 700 K.

The tunnel magnetoresistance was implemented for the freshly condensed Co and Fe films in the thickness range of  $d_{\text{Co}} = 5\text{-}25$  nm and  $d_{\text{Fe}} = 7\text{-}30$  nm. The maximum value of TMR at room temperature was 1% for the fresh condensed films ( $d_{\text{Fe}} = 17$  nm) and Fe films annealed at the temperature of 520 K ( $d_{\text{Fe}} = 8$  nm). Annealing of Co films in the range of effective thickness of 15-25 nm at the temperature of 700 K led to the emergence of anisotropic magnetoresistance. The annealing did not change the type of magnetoresistance for Fe films, although its value decreased to 0.1%.