Nanocomposites and nanomaterials

Magnetic Dynamics of $Fe_{20}Pd_{80}$ Thin Films and Circular Dot Arrays.

E.V. Tartakovskaya[1], O.Y. Salyuk[1], G.N. Kakazei[2], O. Yanevich[3], V.O. Golub[1]

[1] *Institute of Magnetism, NASU and MESU, 36-B Vernadsky blvd., 03142 Kyiv, Ukraine.*
E-mail: golub@imag.kiev.ua

[2] *Institute for Nanoscience and Nanotechnology and Department of Physics, University of Porto, Rua Campo Alegre 687, 4169 - 007 Porto, Portugal*

[3] *National Aviation University, 1 Kosmonavta Komorova pr., 03058 Kyiv, Ukraine*

Ordered alloys based on Fe or Co and noble metals like Pt or Pd are very attractive for different applications: in high density magnetic recording media (data storage), as permanent magnets, as ferromagnetic shape memory actuators and for drug-delivery in medicine. Such wide range of potential applications is related to unique properties of these alloys, which are also very interesting from the point of view of fundamental physics. Especially this concerns the FePd alloys, where large polarization of Pd leads in presence of 3d transition ferromagnetic metal to easy transformation of paramagnetic palladium into ferromagnetic one. Although studies of FePd are in progress during several decades, its magnetic properties are still not entirely understood.

Temperature dependence of spin-wave spectra in perpendicularly magnetized ultra-thin FePd film as well as in arrays of thin circular FePd dots were studied using ferromagnetic resonance (FMR) technique. The dots and film thickness was fixed at 10 nm. The dot of the diameter 450 nm formed square arrays with the interdot distance of 62 nm. The specific structure of multiresonance FMR spectra both in the film and dot arrays suppose an arising of additional spin-wave modes due to the magnetic polarization of Pd atoms in FePd alloy.

To explain FMR data we propose a theoretical approach which is a generalization of previously developed analytical theory of dipolar-exchange standing spin waves in circular disks [1]. In the present case, the calculations take into account two magnetic sublattices with different exchange and magnetization parameters (Fe and Pd) as well, as weak inhomogeneity of the spin wave profiles along disks' thickness.

1. *Bunyaev S.A., Golub V.O., Saliuk O.Yu., Tartakovskaya E.V., et.al.* Splitting of standing spin-wave modes in circular ferromagnetic dot under axial symmetry violation // Scientific Reports.-2015.-**5**.-art. 18480.