Posterprize MDMR:
Andrey Petrov

Ultrafast Magnetization Dynamics in Thin Films of L10-Ordered FePt and FePd Compounds

A. V. Petrov[1], M. V. Pasynkov[1], R. V. Yusupov[1], S. I. Nikitin[1], A. I. Gumarov[1], I. V. Yanilkin[1], A. G. Kiiamov[1], L. R. Tagirov[1,2]
1 Institute of Physics, Kazan Federal University, Kazan 420111, Russian Federation
2 Zavoisky Physical-Technical Institute, FRC Kazan Scientific Center of RAS, Kazan 420029, Russian Federation

Intermetallic compounds and heterostructures based on elements of the platinum group are the basis of modern media for super-dense magnetic recording of information. The choice is determined by the unique magnetic properties of such compounds and long-term stability, as well as the insensitivity of their magnetic properties to the corrosive effects of oxygen and air humidity. [1]
Thin films of FePd and FePt compounds 10 nm thick were grown by mo- lecular beam epitaxy (MBE) on MgO (001) substrates at room temperature in an ultrahigh-vacuum chamber on a 3 nm thick chromium (Cr) seed layer deposited at a substrate temperature of 600 °C. To transfer the equimolar systems FePd and FePt to the ordered tetragonal phase $L1_0$, the film was annealed for 30 minutes at a temperature of 650 °C.
The crystal structure and epitaxiality of the grown FePd and FePt films were studied by low-energy electron diffraction (LEED) methods directly in the ultrahigh-vacuum chamber and X-ray diffraction (XRD) analysis. The contrast- ing patterns of the LEED maxima indicate the single-crystal nature of the films and their coherent growth on substrates, that is, cube by cube type epitaxy. The observation of the (001) maximum along with (002) in the X-ray diffractogram indicates the tetragonal symmetry of the crystal lattice of the films, which, in turn, indicates their successful synthesis in the desired ordered $L1_0$ phase.
Using femtosecond optical and magnetooptical spectroscopy, it was shown that thin films of the $L1_0$ phases of FePd and FePt compounds are character- ized by different times of photoinduced demagnetization. Such a difference is a prerequisite for the creation of artificial multilayer ferrimagnetic structures of the F1/N/F2 type, where F1 and F2 are ferromagnetic layers, the nature of the interaction between which is determined by the thickness of the separator made of normal metal N. The difference in the demagnetization rates is a necessary condition for ultrafast photoinduced handling magnetization.
In the future, the synthesis of three-layer structures based on $L1_0$-FePd and $L1_0$-FePt is supposed. The latter are isostructural and have very close lattice constants, both with respect to each other and to the $Fe_{0.08}Pd_{0.92}$ system. This makes it possible to create perfect heteroepitaxial structures based on them.

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George Andreev

Abnormal Magnetism of Nano- and Microscaled Tetrafluorites $LiTbF_4$ and $LiDyF_4$

G. Yu. Andreev[1], A. G. Kiyamov[1], S. L. Korableva[1], A. A. Rodionov[1], I. V. Romanova[1], A. S. Semakin[1], M. S. Tagirov[1,2]
1 Kazan Federal University, Kremlevskaya 18, Kazan 420008, Russian Federation
2 Institute of Applied Research, Tatarstan Academy of Sciences, Levobulachnaya 36a, Kazan 420111, Russian Federation

Rare earth tetrafluorides $LiReF_4$, Re = La—Lu, are a promising material for laser technology [1, 2], medicine and biotechnology[3]. $LiTbF_4$ is an Ising dipolar uniaxial ferromagnet; $T_C = 2.8741(16)$ K [5]. $LiDyF_4$ is a layered antiferromagnet; $T_N = 0.610(15)$ K [5].
Nanosized powders of $LiTbF_4$ were synthesized using hydrothermal method[6]. Microsized $LiTbF_4$ and $LiDyF_4$ powders were baked at 650. XRD patterns, TEM HR and optical microscope were used for characterization. Temperature and field dependencies of magnetiztion were measured at the vibrational magnetometer. $LiTbF_4$ nanopowder at $B = 10$ mT showed reduction of Curie temperature compared with monocrystal. Field dependence of $LiDyF_4$ micropowder's magnetization at temperatures below 7 K takes the form of antiferroelectric hysteresis. Temperature dependence of loops' area is measured. Also, this sample's magnetisation does not set instantly when the external field is set, but follows exponential law $\exp(-t/\tau)$. Values of τ are different for magnetization and demagnetization of $LiDyF_4$ micropowder.
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