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EXAFS AND XRD STUDIES OF CRYSTALLOGRAPHIC GRAINS IN NANOCRYSTALLINE FePd:Cu THIN FILMS

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The FePd $L1_0$ phase alloys belong to the systems, which are very interesting due to their promising magnetic properties and forthcoming applications in recording devices [1]. The magnetism of the system is correlated very strongly with crystallographic structure, in particular with grain size and grain shape [2].

[Fe(0,9nm)/Pd(1,1nm)/Cu(*d* nm)]×5 multilayers were prepared by thermal deposition at room temperature in UHV conditions on Si(100) substrates covered by 100 nm SiO_2. The thickness of copper layer has been changed from 0 to 0.4 nm. After the deposition, the multilayers have been rapidly annealed at 600^{o}C in nitrogen atmosphere, what resulted in the creation of FePd:Cu alloy.

The structure of obtained alloy films was determined by x-ray diffraction (XRD), glancing angle x-ray diffraction (GAXRD), and x-ray absorption fine structure (EXAFS). The chemical composition of the films was checked by Rutherford backscattering (RBS). The measurements clearly showed that for all investigated copper compositions the $L1_0$ FePd:Cu nanocrystalline phase has been formed during the annealing process.

The paper concentrates on crystallographic grain features analysis of obtained alloys and illustrates how the EXAFS technique can help to extend the information about grain size and grain shape of poorly crystallized materials. The comparison of EXAFS and XRD results gives a reasonable agreement. Using appropriate models we show the reasons of possible differences between the results obtained from XRD and more challenging EXAFS analysis applied to FePd:Cu system.

References

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