

## Nanogranular Co-Al-O films prepared by laser ablation

Oleksandr Chayka<sup>\*1</sup> – Luděk Kraus<sup>1</sup> – František Fendrych<sup>1</sup> – Tomáš Kocourek<sup>1</sup> –  
Miroslav Jelínek<sup>1</sup> - Vladimír Sechovský<sup>2</sup>

<sup>1</sup> Institute of Physics, ASCR, Na Slovance 2, CZ -18221 Prague8, Czech Republic

<sup>2</sup> Charles University, Faculty of Mathematics and Physics, Ke Karlovu 3, CZ-12116 Prague, Czech Republic

\*Corresponding author: e-mail: chayka@fzu.cz, Phone: +420 266 052 658, Fax: +420 233 343 184

Nanogranular Co-Al-O films were prepared by pulsed laser deposition from  $\text{Co}_x(\text{Al}_2\text{O}_3)_{1-x}$  targets. Three targets, with different Co volume fractions, were used in order to study the influence of the film composition on magnetic and transport properties.

The samples deposited on room temperature substrates exhibit a granular structure consisting of Co grains with the size of few nm embedded in an insulating  $\text{Al}_2\text{O}_3$  matrix. The magnetic properties show a gradual transition from a low temperature blocked regime to a high temperature superparamagnetic state. It is confirmed by the disappearance of magnetic hysteresis at high temperatures and the temperature dependence of magnetization (Fig.1). The electric resistance as a function of temperature well satisfies the  $\log R \propto T^{-1/2}$  relation, which is characteristic for tunneling type of conductivity in insulating granular systems [1]. Magnetoresistance (MR) higher than 9% at 20K can be found in  $\text{Co}_{26}\text{Al}_{23}\text{O}_{51}$  film (Fig.2). MR is temperature dependent and increases about twice when temperature decreases from 300K to 20K.

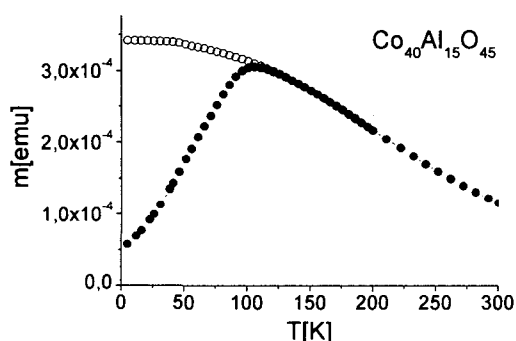


Fig.1. Temperature dependence of magnetization.

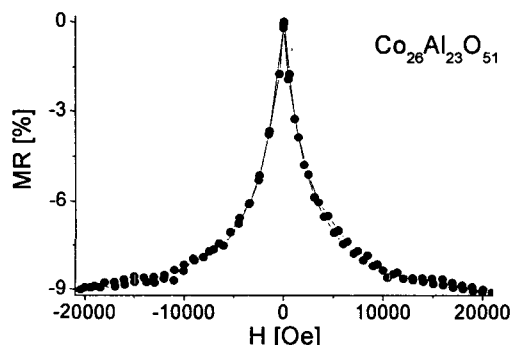


Fig.2. Magnetoresistance measured at 20 K.

### References

[1] P. Sheng, B. Abeles, and Y. Arie, Phys. Rev. Lett. 31, 44 (1973)

**Acknowledgement:** The work was supported by the Grant Agency of the AVCR (grant No. A 1010204) and MSMT CR (project No. OC 523.100).