



NATO SCIENCE PROGRAMME
Cooperative Science and Technology Sub-Programme
COLLABORATIVE LINKAGE GRANT
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1. PROJECT TITLE & DURATION:

Novel magnetic nano--structures for sensor fabrication
April 2004-December 2006

2. PRINCIPAL INVESTIGATORS

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3. PROJECT KEYWORDS:

sensor; giant magnetoresistance; self –assembled nano-particles; AgCo systems; spin dependent tunnelling; processing procedures

4. RESEARCH PLAN

In the quest for new, cost effective, highly thermally stable, types of sensors based on giant magneto-resistance (GMR) or spin dependent tunnelling (SDT) effects, novel magnetic nano--structures obtained by self-organisation of magnetic nano-particles onto suitable substrates are among most promising ones. The proposed approach consists of using recently developed Ag/Co nano-particles that self assemble into quasi-regular 2D arrays deposited onto suitable substrates. The AgCo system, has been proved to be suitable for use as magnetic sensors [1]. We have recently started to create a magnetic GMR sensor based on Ag-Co multilayers, which gave reliable and stable response in detecting small magnetic fields. As spin dependent electron transport properties are highly dependent upon the rate of spin dependent scattering at the magnetic /non magnetic interface, roughness and volume fraction of this interface, it is expected that also the self-assembled AgCo nano-particles will exhibit sensitive and stable GMR response. The alternative possibility is a regular arrays of sensors on a single chip containing nano-particles, acting as the sensing element instead of multilayers. The multi-layer deposition techniques, highly expensive and inadequate for a mass production, could be replaced by the low cost effective self-assembly technique. In order to reach highest performances in a rather short time, the actual project envisages an interdisciplinary deep investigation, using both complementary facilities and team's abilities. The proposed materials are suitable for document validation including detection of counterfeit currencies and credit cards, part of the program against terrorism and for society protection.

1. «GMR study leading to sensor fabrication on Ag-Co multilayers»

M. Angelakeris, P.Poulopoulos, O. Valassiades, N.K. Flevaris, D. Niarchos and A. Nassiopoulou:
Sensors and Actuators **A91**, 180 (2001).