# Advanced Materials for Intelligent Applications. New Developments at NIRDTP Iasi

Horia Chiriac*
*National Institute of Research and Development for Technical Physics, 47 Mangeron Boulevard, 700050 Iasi, PO 3, PO Box 833, Romania*

Nowadays, concentrated efforts are focused on finding innovative and modern solutions to prepare and characterize novel magnetic nanomaterials or/and glassy/nanostructured magnetic materials, but also to understand the intrinsic mechanism governing their specific magnetic behavior, especially the role of the local nanostructures on the magnetic properties.
Details on the preparation, characterization and applications of a few new magnetic nanomaterials as well as amorphous and nanostructured materials such as nanopowders, micro and nanowires, thin films, two-dimensional and three-dimensional materials prepared by continuous casting methods (ribbons, wires, microwires, bulk shaped alloys) will be presented. Different types of magnetic field sensors, displacement and torsion sensors will be presented in connection with the specific properties of magnetic wires. Special emphasis will be on the description of magnetic sensors based on magnetic glass-coated microwires, mainly used for security, electronic surveillance, antitheft and shielding in the microwave region applications, or more recently as biosensors for the detection of biomolecules. The recent development of magnetic nanowires electrodeposited in the nanopores of alumina or polycarbonate membranes, offers new and multiple possibilities for the design and fabrication of miniaturized magnetic sensors and actuators. Two types of magnetic sensors and actuators based on magnetic nanowires arrays will be presented in connection with their applications: (i) “bar-code” type biosensors using combinations of magnetic (mainly amorphous Fe and Co-based alloys) and nonmagnetic (mainly noble metals) multilayered nanowires, for multiple biomolecules detection and manipulation; (ii) magnetostrictive actuators based on magnetostrictive nanowires arrays in combination with MR sensors for cochlear implants. The applications of different multilayered nanowires arrays, consisting in suitable combinations of magnetic and non-magnetic layers, in spin-valve devices will be discussed, too.

* E-mail: hchiriac@phys-iasi.ro, Tel: +40-232-430680; Fax: +40-232-231132.

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***Horia Chiriac*** *received the B.Sc. (1962) and Ph.D. (1978) degrees in physics from the "Alexandru Ioan Cuza" University of Iasi, Romania. Currently, he is the Director of the National Institute of Research and Development for Technical Physics, Iasi and associate professor and PhD supervisor at "Alexandru Ioan Cuza" University of Iasi. His main interests can be summarized as follows: (i) preparation and characterization of amorphous and nanostructured/nanocomposite magnetic materials as ribbons, wires, glass covered wires, thin films, powders, bulk shaped samples; (ii) preparation and characterisation of novel nanomaterials and their use in different nanotechnologies; (iii) theoretical studies on the correlation between the preparation conditions of amorphous, nanostructured/nanocomposite metallic materials and nanomaterials and their magnetic properties; (iv) theoretical models for explanation of magnetisation processes, magnetoelastic properties and new magnetic phenomenon in nanomaterials, amorphous and nanocrystalline/nanocomposite magnetic materials; (v) new types of magnetic sensors and transducers based on nanomaterials, amorphous and nanostructured/nanocomposite magnetic materials. He published over 300 papers in international journals (ISI) and is the author/co-author of over 30 patents, from which 4 are international, and over 20 technologies.*