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Valentin Alek Dediu
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CV

Valentin Alek DEDIU is leader of the magnetic and spintronic group at the Institute of Nanostructured Materials, Italian National Council of Research. He graduated in experimental physics in 1982 at the Moscow Physical-Engineering University and accomplished his Ph.D. on superconductivity in 1989 at Lebedev Institute in Moscow.

Alek Dediu pioneered in early 2000 the first experimental evidences on molecular spintronics, moved to the development on organic based spintronic memristors, and in the 2010-2015 period contributed to the development of the spinterface concept, the most advanced achievement of the molecular spintronics.

He is also actively promoting various magnetic solutions for bio-medical applications, among which he pioneered the idea of magnetic scaffolds for tissue engineering (project MAGISTER) and that of an innovative magnetic lab on chip for ultrasensitive bio-diagnostics (project MADIA).

His main research interests are: molecular spintronics, interface physics and quantum engineering, memristive properties and neuromorphic computing, nanomagnetism for medical applications and others.
Actively participates in EU Framework Programs, coordinating the projects FP6-NMP-OFSPIN, FP7-NMP-HINTS, FP7-NMP-MAGISTER, H2020-ICT-MADIA, H2020-FET-OPEN-INTERFAST (in progress). He was also WP leader of the large EU network project COST-MOLSPIN.

Giovedì 19 Maggio 2022
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TEAMS : bfi827c

Tuning the coercive fields in thin Co films interfaced with molecules – fundamentals and application in sensing

Abstract
Developing new magnetic materials for sensing and memory applications represents one of the most fruitful and actively growing research areas. Along this line, tailoring of the surface and interfacial magnetism has proved as efficient and versatile approach to create materials with ad hoc shaped properties. The hybridization at 3d-ferromagnet/molecule interfaces was recently used to modify the magnetic anisotropy of the ferromagnetic layers. The hybridization between molecular orbitals and d-orbitals of the ferromagnetic surface induces modifications of the effective spin-orbit coupling, density of states and other fundamental parameters. I will overview the main results and tentative theoretical descriptions. Further I will report on the extraordinary modification of the magnetic anisotropy in polycrystalline Co thin films interfaced with various molecular layers detected in our laboratory. The effect is present even at room temperature, resulting in significant and device relevant enhancements, and grows enormously at low temperatures reaching for example one order of magnitude increase at 150 K. On the fundamental side, the understanding of these effects is by itself challenging and puts basis for a new topic inside the magnetism. A tentative model based on the correlated magnetic disorder, established at the metal-molecular interface, will be presented.
On the application side, magnetoresistive sensors based on Co and other 3d metals or alloys represent an excellent tool for sensing in various lab-on-chip configurations for health, environment and security monitoring. A summary of the experiments performed in our laboratory along this line will be reviewed.