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Laboratory for the synthesis of magnetic thin films

The laboratory is comprised of a modular complex Ultra-High-Vacuum Deposition system operating in Ultra High Vacuum conditions (10^{-9} –10^{-10} Torr). This complex elaboration system is placed in a special “grey-room” environment, separated by a front-mounted room from the rest of the facilities. The main UHV Deposition system is equipped with sputtering magnetrons and can be extended to other complementary evaporation sources, such as effusion cells and multi-crucible electron gun. The confocal geometry of the source’s ports enables the co-deposition of up-to 7 different materials, from different sources, enabling complex material structures and multilayer architectures. The main deposition chamber is separated by a gate-valve from a load-lock chamber from which, using al linear UHV manipulator, the samples can be transferred into the UHV chamber from atmospheric pressure conditions without breaking the base vacuum. The extendable modular architecture of the deposition is designed to accommodate various in-situ characterisation tools: Reflection high-energy electron diffraction (RHEED), Auger Electron Spectroscopy (AES), in-situ Magneto-optic Kerr effect. For DC magnetron

sputtering, the UHV deposition system is currently equipped with two DC power supplies with a maximum power of 500 W. For RF sputtering we use an RF power supply with a maximum power of 300 W. The temperature of the substrate during the growth or post-growth annealing stages can be controlled within the 300-1000K range. Moreover, the layer thickness and the deposition rate can be precisely measured in real time using a quartz oscillator thickness monitor. With these synthesis facilities, the equipment allows the elaboration of simple or complex magnetic and non-magnetic thin films multi-layered stack of various type: metals, complex alloys, insulators. Their structural properties can be tuned from amorphous to polycrystalline, single crystal and epitaxial quality.

The complex thin film heterostructures that can be elaborated with these facilities and tools focus on various potential applications of thin films in Nanomagnetism, Spintronics, and Condensed Matter. They should answer to emerging challenges and requests in many fields: Conventional and Spin Electronics, Innovative Advanced Materials with tailored functional properties, Quantum and neuromorphic materials and technologies, Artificial Intelligence Devices, Information Communication Technologies, Sensors, etc.

At the Faculty of Physics, Babes-Bolyai University, the equipment is used for teaching, practicing and research activities at different levels: undergraduate, graduate, master, and PhD.

The access to the research facilities provided by this equipment is opened to trained users with proven expertise in film deposition elaboration and characterisation tools. For external users, having in view the complexity of the equipment and its implication in local strategic R@D projects the access implicates a simplified research proposal procedure whose approval considers the mutual research interest and available schedule. The costs for external users should cover materials (substrates, targets, gases, liquid N_2, etc) and workmanship, depending on the quantity and complexity of the samples. There are no costs in case of collaboration projects and agreements.

Access program:

8 – 20, from Monday to Friday, excepting the maintenance periods.

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http://phys.ubbcluj.ro/ursu/laboratoare/Tiusan_EN.pdf
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