PhD POSITION AT UNIVERSITAT AUTÒNOMA DE BARCELONA

Project Title: Electrodeposition of rare-earth- and noble-metal-free hard-magnetic and magnetostrictive alloys.

Objectives: Electrodeposition of hard magnetic (Fe- and Al-based) and magnetostrictive (Fe- and Cu-based) films and patterned structures from aqueous electrolytes and ionic liquids; Comparison of material properties; Characterization of mechanical and corrosion performance; Assessment of thermal stability.

Expected Results: Optimization of current efficiency and control over stoichiometry and structure to reach hard-magnetic or magnetostrictive properties; balanced mechanical properties and corrosion resistance.

The **Universitat Autònoma de Barcelona (UAB)** is one of the main public universities in Spain. Last year, UAB was awarded the **"**Campus of Excellence**"** for the activities related to the fields of nanoscience and nanotechnology. Indeed, in addition to educational objectives, UAB intends to establish itself as one of the research icons in Europe. Our Group has several years experience of successful recruitment, training and integration of individuals into multinational R&D teams. UAB is used to participating in collaborative R&D projects at international level and also have links to industry. The Spanish Ministry of Education and Sciences has recognised the PhD studies on Materials Sciences of the UAB as **"**Doctorado de Calidad**"**. UAB offers a Master on Materials Sciences and Nanotechnology with more than 30 students from several countries. For further information: http://www.uab.cat/

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Application procedure: Interested applicants should provide a full CV, a letter of interest and fill the following online form: http://selecta-etn.eu/job-application-form

PhD POSITION AT UNIVERSITAT AUTÒNOMA DE BARCELONA

Project Title: Template-assisted and template-free electrodeposition of nanoporous metallic coatings.

Objectives: Direct electrosynthesis of alloy and bimetallic Fe- and Cu-based nanoporous films using either mild hydrogen evolution or surfactants, or masks (i.e.: colloidal lithography); structural characterization of the pore network.

Expected Results: Fabrication of pseudo-ordered or periodic porous metallic coatings; tuneable wettability and magnetic properties as function of the porosity degree.

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3 ESR positions available at the Department of Materials Science and Metallurgy University of Cambridge, UK, as part of the SELECTA Project.

Description

The SELECTA consortium aims to design, fabricate and characterize **S**mart **ELECT**rodeposited **A**lloys for environmentally sustainable applications: from advanced protective coatings to micro/nano-robotic platforms. As an essential part of this development, comparisons will be made with materials formed using alternative fabrication techniques. At Cambridge we have much experience in the development and control of thin films, including nano-structured composites, magnetic materials and devices, principally fabricated by Physical Vapour Deposition.
http://www.dmg.msm.cam.ac.uk/research.php?page=Thin%20Film%20Development

Building on this experience, we will develop technology transfer towards the application of electro-deposition for the fabrication of similar materials and structures, and the use of “green” compositions.

Work at Cambridge will include the fabrication of thin films and hetero-structures using our extensive ultra-high vacuum magnetron sputtering facilities:
http://www.dmg.msm.cam.ac.uk/equipment.php

Detailed structural and property comparisons will be carried out using the broad range of advanced characterization equipment available within the Materials Science Department (and elsewhere in the University). This includes advanced X-ray diffraction techniques, Scanning Probe Microscopy, Thermal Analysis, and Electron Microscopy; as well as high resolution mechanical, electrical, and magnetic characterization.

Design and Mechanical Properties of Sustainable

Amorphous and Nanocrystalline Electrodeposits (ESR3). This project will involve the design and development of novel amorphous / nano-crystalline metal-ceramic composite thin film structures. ‘Merit indices’ will be derived to guide materials selection for a range of applications, including tribological coatings, for which, outstanding hardness, wear resistance, adhesion, and thermal stability are required. For example, the demonstration of tunable metal-ceramic ratios to provide tunable thermal expansion coefficients will lead to the capability for fabrication of optimally stable hetero-structures for high temperature applications.

Based upon our present understanding of sputter-deposited metal-ceramic nano-composites, we will develop 'green' compositions with similar properties, and explore ways of making comparable films by electrodeposition (including electrophoresis if required).

Fabrication of Magnetic Films and Patterned Structures using Physical Methods (ESR12). Work on this project will focus upon the preparation of Fe-based magnetic alloys by Physical Vapour Deposition (PVD), using our specialized thin film growth equipment at Cambridge, and based upon existing experience in the growth of, for example, shape-memory metals and Heusler alloys. Thin film microstructures leading to controllable magnetic anisotropy will be developed. Similar alloys will be fabricated by electrodeposition during secondment at partner institutions, and films from both sources will be subject to detailed analysis and characterization. These studies will lead to the ability to mimic, and improve upon, PVD-produced film properties by electro-deposition. Further property control and optimization will be achieved through the application of patterning techniques to fabricate 3D structures, such as micro-pillars.

Design and Fabrication of Multilayer Systems for Microdevice Applications (ESR13). Here, multilayer systems will be developed for magneto-electronic micro-device applications. Simulation and modeling of multilayers will be performed, including the study of interlayer effects, and the influence of microstructure and interfaces. Multilayer structures

will be fabricated by both Physical Vapour Deposition and electrodeposition, combined with extensive characterization and analysis for structure and property determination. The influence of multilayer design, and the control of microstructure and interface quality through the growth parameters, will be studied, leading to the fabrication of optimized prototype devices.

The contract will be for 3 years and each ESR will be registered as a PhD student at the University of Cambridge. Applicants must NOT have resided in the UK for more than 12 months in the 3 years before the project start date.

Application form: http://selecta-etn.eu/job-application-form

PhD POSITION AT UNIVERSITY OF IOANNINA

Project Title: Design of Fe-, Cu- or Al-based functional coatings by molecular dynamics simulations and DFT calculations

Objectives: Design of Fe-, Cu- or Al-based materials with enhanced mechanical properties; Calculation of the basic mechanical quantities and stress-strain curves using molecular dynamics simulations; Study of several structures, geometries and size effects; investigation of adhesion of suitable molecules and/or H2O on Fe-, Cu- or Al-based coatings towards an understanding of the coating's corrosion resistance and/or hydrophobic features by density functional theory calculations.

Expected Results: Design of Fe-, Cu- or Al-based alloys for sustainable coatings applications, e.g. in terms of wear, polarity, biofouling and/or corrosion resistant properties.

Requirements: The candidate must be fluent in spoken and written English. The candidate should hold a Masters degree in Physics, Materials Science or Chemistry or having basic knowledge on quantum mechanics and computational methods are encouraged. Possible experience in ab-initio calculations using DFT, LAPW or Tight-Binding methods as well as classical Molecular Dynamics Simulations will be taken into account.

The **University of Ioannina**, founded in 1964 at the north-west part of Greece, Ioannina/Epirus, includes 17 academic Departments, which altogether number 13,523 undergraduate students, while it consists of 549 Members of Academic Staff. The **Department of Materials Science and Technology**, founded in 1999 with mission, except from the teaching, the Materials Science focusing on the design and production of new advanced materials that include polymers, metals and alloys, ceramics and oxides, as well as semiconductors and devices for electronic and optical applications. For further information: http://cmsl.materials.uoi.gr/

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Application procedure: Interested applicants should provide a full CV, certificates of the grades of examination, a letter of interest, describing their research career goals, skills and experience, as well as two letters of recommendation and fill the following online form: http://selecta-etn.eu/job-application-form

PhD POSITION AT CHALMERS UNIVERSITY OF TECHNOLOGY

Project Title: In-depth microstructural characterization of sustainable electrodeposited alloys with dissimilar dimensionality: from continuous films to nanostructures.

Objectives: Sample size effects will be investigated and a combination of advanced characterization techniques will be applied for microstructural characterization of different fully dense and porous electrodeposits. The deviation in some characteristic mechanical/magnetic properties (e.g. hardness and ductility) will be used for evaluating the performance changes resulting from microstructural changes. Thermal stability will be one of the parameters for assessing the material's potential in technological applications.

Expected Results: Effect of sample miniaturization on the microstructure and materials properties; determination of the key structural parameters (phase content and distribution, grain size, texture, etc) that affect mechanical/magnetic properties; determination of thermal stability by monitoring microstructural changes during exposure to elevated temperatures (combination of in-situ TEM and furnace annealing experiments); assessment of the materials regarding possible technological applications.

The **Department of Materials and Manufacturing Technology at Chalmers University of Technology** consists of six research groups and has a total staff of around 65 people. The research activities span from basic research on nanostructured materials to product- and process related issues within materials and manufacturing technology. The research is carried out in close collaboration with national and international industries and universities. Graduate as well as undergraduate education is organized in a wide range of courses; the department is involved in three masters' programmes and three graduate schools. For further information: http://www.chalmers.se/en/departments/mmt/Pages/default.aspx

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Application procedure: Interested applicants should provide a full CV, a letter of interest and fill the following online form: http://selecta-etn.eu/job-application-form

PhD POSITION AT LEIBNIZ INSTITUTE FOR SOLID STATE AND MATERIALS RESEARCH, IFW

Project Title: Mask-free electrodeposition of Fe-Mn films/structured deposits with functional properties

Objectives: Depending on their composition and microstructure, Fe-Mn alloys offer a broad spectrum of functional properties. This comprises superelasticity and shape memory behaviour or controlled corrosion resistance which makes them attractive as materials for biodegradable micro-implants. Moreover, Fe-Mn is often used as antiferromagnetic layer in spin valve systems. The project aims at the development of an electrodeposition process for Fe-Mn(-X) (X=B,C <1 %) thick and thin films/ thin film systems and functionally structured deposits under use of an environmental-friendly electrolyte. The effect of deposition parameters/conditions (including electrolyte additives or external magnetic fields) and post-treatments on underlying electrochemical/chemical processes and on morphology, structure and composition of the deposits will assessed. Advanced methods for characterization of structural, corrosive, mechanical and magnetic properties from macro-to nanoscale are to be applied.

Expected Results: functional deposits as films, film systems or micro/nano-structures with attractive corrosion and mechanical properties or magnetic performance; description of fundamental relations between deposition parameters, deposit structure and functional properties; demonstrators

The **IFW** is a non-university research institute and member of the German Gottfried Wilhelm Leibniz Association. More than 200 scientists are involved in modern materials science and explorative research in physics and chemistry with view to technological developments. The focus is on relations between fundamental and application-related characteristics of materials, investigations of structural properties, failure mechanisms and processing conditions for property optimization. Collaborations are with universities and other higher education establishments with emphasis on the training of young scientists and also with the industrial sector. For further information: http://www.ifw-dresden.de/

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Application procedure: Interested applicants with profound knowledge in physical chemistry and readiness to work on this interdisciplinary research topic in a collaborative network of

scientists should provide a full CV, a letter of interest and fill the online form: http://selecta-etn.eu/job-application-form

PhD POSITION AT VILNIUS UNIVERSITY

Project Title: Electrodeposition of amorphous-like/nanocrystalline Fe-(W,Mo) alloys and composites.

Objectives: Study of induced codeposition mechanisms between Fe and refractory elements (Mo, W). Study of the effects of electrolyte temperature / Fe(II) concentration on alloy properties (mechanical and corrosion); pulse plating deposition; comparison studies between conventional Hull and rotating Hull cells.

Expected Results: Fabrication of mechanically hard Fe-based alloys and composites. Optimization of electrodeposition modes (direct current versus pulse current), bath formulation (including aqueous solutions and low temperature melts); determination of the electrochemical conditions leading to nanostructured and amorphous films.

Vilnius University (VU) was established in 1579 and is the oldest university in the Baltic States. Now it is the largest university in Lithuania and has a highest rating among Baltic States universities; it is among of 5% highest rated universities. Since 1991, VU has been a Signatory to the Magna Charta of European Universities and a member of the European University Association (EUA). VU act as active participant in: 39 FP7 projects, 6 NATO projects, 46 COST projects. There are 90 bilateral cooperation agreements signed. As it was noted in evaluation report prepared by international expert group for the Lithuanian Centre for Quality Assessment in Higher Education (2011), Faculty of Chemistry (CHF) has a significant research potential that may be used both inside and outside the Lithuania high quality research in the broadly defined field of nanoscience & nanobiotechnology, chemistry & materials science. CHF has a strong Management and Cooperation Potential: researches participated and participate in more than 30 projects, including FP7 TEMADEP (2011-2013); Lithuania-Taiwan-Latvia (2011–2013), European Social Fund Agency projects; Lithuania-Belarus project (2011-2012). For further information: http://www.chf.vu.lt/fizikines-chemijos-katedra/darbuotojai/prof-dr-henrikas-cesiulis/

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Requirements for applicants: We are seeking highly motivated candidates with a diploma/master's degree in chemistry, materials science or related fields. The ability to carry out research projects independently and very good English writing and speaking skills are expected. Applicants should have to demonstrate clearly the background in electrochemistry (theoretical or applied), solid materials characterization technique and a keen interest in fundamental research questions. Additional experience math and applied software, skill in computation data treatment, math simulation, analytical and physical chemistry is beneficial but not required.

Application procedure: Interested applicants should provide a full CV, a letter of interest and fill the following online form: http://selecta-etn.eu/job-application-form

PhD POSITION AT FACULTY OF ENGINEERING, UNIVERSITY OF KRAGUJEVAC, FINK

Project Title: Effect of porosity on the mechanical and tribocorrosion behavior of Fe-, Cu- and Al-based alloys and bimetallic layers: fundamentals and engineering applications.

Objectives: Modelling of flow and mechanical behaviour of nanoporous materials; comparison of porous and non-porous coatings; Characterization of mechanical and tribocorrosion properties of sustainable coatings and foams; Engineering applications (membranes for water purification).

Expected Results: Mechanical and tribocorrosion properties of Fe-, Cu- and Al-based coatings and foams; Effects of composition, microstructure and surface morphology on corrosion, tribocorrosion and antibiofouling properties; Simulation, analysis for potential applications as membranes for water purification.

FINK has more than 50 years of experience in research and education in engineering sciences, with the highest number of international and national research and training projects in Serbia, and publications in high-ranked peer reviewed scientific journals. Faculty currently has around 1200 students, 100 PhD students and 70 teaching staff and comprehensive facilities for education and research. FINK has research collaborations with numerous world renowned universities. For further information: http://www.mfkg.rs/eng/

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PhD POSITION AT THE NATIONAL INSTITUTE FOR METROLOGICAL RESEARCH (INRIM)

Project Title: Low dimensional dense and nanoporous Fe-based alloys: synthesis, microstructure and magnetic properties.

Objectives: Characterization of the magnetic and mechanical properties of Fe-based amorphous alloys synthesized by electrodeposition and alterative techniques (physical); Chemical and electrochemical de-alloying of Fe-X' where X'= Mn, Zn, Bi, Cu, Sn samples; magnetic and optical properties of nanoporous materials; Sequential EBL and FIB nanolithography to fabricate magnetic MEMS/NEMS (ultra-sharp magnetic MFM tips).

Expected Results: Synthesis of nanoporous magnetic materials and amorphous Fe-based amorphous alloys; Prototype fabrication of ultra-sharp magnetic MFM tips.

The **National Institute for Metrological Research (INRIM)** focuses on studying metrology (measurement sciences), and on conducting research on materials, as well as on developing innovative technologies and devices. As the leading metrological institute, INRIM defines the primary standards for basic and derived units of the International Unit System (SI), ensuring compliance with said standards, their international comparison and providing traceability of Italian measurements to the SI. In this role INRIM has published significant results studying nanotechnologies, metrology for biosciences, chemistry and the environment; the nanofabrication laboratory Nanofacility Piemonte provides an infrastructure for the manipulation of new types of nano-objects by nanolithography and for the development of innovative structures for high-density magnetic recording and sensing. For further information: http://www.inrim.it/index_i.shtml

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PhD POSITION AT HAPPY PLATING

Project Title: Development of green electrolytes for sustainable industrial production of magnetic alloys.

Objectives: Design of novel electrolytes free from scarce and toxic metal cations and other concerning substances; bath factorial design; direct and pulse electrodeposition of sustainable magnetic alloys: (Fe,Cu)MnBi; Fe(B,Mn,Sn,W).

Expected Results: Exploitation of new electrolyte formulations as a replacement of conventional and harmful ones; Determination of the relationship between bath components (i.e. additives) and applied parameters on alloy properties.

Happy Plating (SME, Austria) develops product oriented, forward-looking solutions for tailoring technical surfaces. The test of feasibility and production of high quality products in larger series completes the programme of Happy Plating. With respect to the field of micro-& nanotechnology, Happy Plating investigates the impact of pulse plating on metal deposition by using numerous pulse plating techniques, a core competence of Happy Plating. In this field Happy Plating has an outstanding and scientifically leading position in Europe. The up-scaling of results from R&D and the industrial implementation of electrochemical (pulse) processes is another core competence of Happy Plating offered to customers worldwide. Plant design and set-up of production parameters supported by comprehensive prototyping and piloting actions can be performed in a high flexibility and accuracy including pre-serial or specialised, high quality serial production. Happy Plating is very experienced in the participation within collaborative European R&D projects and is in cooperation with partner Universities all over Europe involved in recruitment, training and integration of young scientists in the field of applied electrochemical surface technology. For further information: http://www.happyplating.eu/en/

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Application procedure: Interested applicants should provide a full CV, a letter of interest and fill the following online form: http://selecta-etn.eu/job-application-form

PhD POSITION AT HAPPY PLATING

Project Title: Medium up-scale fabrication of amorphous/nanocrystalline coatings with high corrosion and wear resistance.

Objectives: Optimization of electrolytes and electrochemical conditions (i.e: modes, anodes, stirring regimes) enabling medium up-scaled fabrication.

Expected Results: Sustainable and durable electrolytes leading to coatings obtained with moderate/high current efficiencies at upscaled conditions. Low-stress, crack-free and adherent deposits with different thicknesses and on different substrates. High-tribocorrosion resistant films.

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PhD POSITION AT SWISS FEDERAL INSTITUTE OF TECHNOLOGY IN ZURICH, ETHZ

Project Title: Miniaturization of electrodeposited materials for environmental small-scale robotics.

Objectives: Fabrication of hybrid magnetic-photocatalytic microrobots by template-assisted electrodeposition.

Expected Results: Template-assisted electrosynthesis of magnetic and photocatalytic materials for applications in environmental microrobotics (e.g. micro/nano-helices). Magnetic wireless actuation of developed microagents using electromagnetic manipulation systems.

The **Swiss Federal Institute of Technology (ETH) Zurich**, which is one of the world's leading universities for technology and the natural sciences. It has nearly 18,000 students from over 100 different countries. The Multiscale Robotics Lab belongs to the Institute of Robotics and Intelligent Systems (IRIS) which is part of the ETH-Zurich and pursues a dynamic research program that maintains a strong robotics research focus on several emerging areas of science and technology. A major component of IRIS research leverages advanced robotics for creating intelligent machines that operate at micron and nanometer scales. IRIS research develops the tools and processes required to fabricate and assemble micron sized robots and nanometer scale robotic components. Many of these systems are used for robotic exploration within biological domains, such as in the investigation of molecular structures, cellular systems, and complex organism behavior. For further information: http://www.iris.ethz.ch/msrl/

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PhD POSITION AT THE SWISS NATIONAL LABORATORY IN MATERIAL SCIENCE AND TECHNOLOGY (EMPA)/ELEOSS

Project Title: Electrodeposited amorphous-like and austenitic stainless steel: synthesis, miniaturization and physical properties.

Objectives: Synthesis of amorphous stainless steel (without using Cr(VI)) for sustainable coatings applications; synthesis of magnetic amorphous steel films and microcomponents; mechanical and magnetic characterisation; miniaturization.

Expected Results: Design and optimization of a Cr(VI)-free formulation to electrodeposit austenitic/amorphous stainless steel with ultra-high strength and wear resistance; Patternability of the electrodeposited stainless steel films using template-assisted electrodeposition; Prototypes of magnetic MEMS in watch components based on amorphous steels.

EMPA is the Swiss national laboratory in materials science and technology and it belongs to the ETH domain (employs a staff of over 1000). The Laboratory for Mechanics of Materials and Nanostructures within EMPA employs about 40 full-time scientists and specialises in the mechanical characterisation of micro- and nanostructures and nanofabrication methods like charged particle beam processing, nanomachining or electrochemical nanostructuring of surfaces. The laboratory receives substantial direct industrial funding. For further information: http://www.empa.ch/plugin/template/empa/1092/*/---/l=1. The mission of **ELEOSS** GmbH is the development, up-scaling and commercialization of innovative electrochemical process such as the electrodeposition of stainless steel. Up to now, no commercial process for the electrochemical deposition of stainless steel is on the market. Stainless steel coatings have numerous applications due to their corrosion resistance, biocompatibility, wear resistance and their surface appearance. In addition, the stainless steel electrodeposition process allows the production of micromechanical parts such as watch components by the so called UV-LiGA method, which is a radical innovation as compared to the current production technologies. ELEOSS GmbH is a spin-off company of Empa and is in CTI startup coaching program of the Swiss innovation promotion agency for business development. For further information: http://www.eleoss.com/

SELECTA project is a **Marie Sklodowska-Curie Innovative Training Network** that offers the possibility to pursue the PhD within the Network at different universities/research centres/companies across Europe. The duration of the appointment is 3 years starting in August 2015 and Marie Curie eligibility criteria must be respected. Eligible early-stage researchers (ESRs) are those who are, at the date of recruitment by the host institution, in the first four years (full-time equivalent) of their research careers. This is measured from the date when they obtained the degree which would formally entitle them to embark on a doctorate. In addition, researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of the host organization for more than 12 months in the 3 years immediately prior to their recruitment. Researchers can be nationals of any country (including all countries outside Europe).

Application procedure: Interested applicants should provide a full CV, a letter of interest and fill the following online form: http://selecta-etn.eu/job-application-form