



Operational Program European Social Fund - Regione Liguria 2014-2020  
ASSE 3 "Education and training"



UNIVERSITÀ DEGLI STUDI  
DI GENOVA

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EXCERPT OF INFORMATION SHEET SCIENCE AND TECHNOLOGY OF CHEMISTRY AND MATERIALS	
GENERAL INFORMATION	
STRUCTURE OF THE TRAINING PROJECT	
<b>DURATION AND ORGANIZATION OF THE COURSE</b>	<p>The course starts officially on 1 of November 2018 and lasts three years. At the end of each year, doctoral students shall present the Teaching Body with a detailed written account of the activities carried out. The Teaching Body may ask for the account to be discussed according to procedures it has established.</p> <p><b>Coordinator of the course:</b> Prof. Adriana Saccone; <b>E-mail address:</b> Adriana.Saccone@unige.it <b>Department coordinating for research:</b> Department of Chemistry and Industrial Chemistry (Dipartimento di Chimica e Chimica Industriale – DCCI)</p>
<b>TRAINING PROJECT</b>	<p>The following 3 projects/scholarships are activated:</p> <p><b>Curriculum SCIENCE AND TECHNOLOGY OF MATERIALS (CODICE 7309)</b></p> <p><b><u>Project/scholarship No. 1: Development of functionalized microarray for the monitoring of low concentration bio-molecules and pollutants.</u></b></p> <p><i>Months abroad: 6</i></p> <p><i>In cooperation with:</i></p> <ul style="list-style-type: none"><li>- PM_TEN S.r.l. (Physical Methods and Technologies for Environmental Needs)</li><li>- Istituto per i Processi Chimico Fisici (IPCF) del Consiglio Nazionale delle Ricerche (CNR), NanoSoftLab</li><li>- Polo Energia Ambiente Sviluppo Sostenibile (EASS)</li></ul> <p><i>Project/scholarship details:</i></p> <p>Development of a functionalized microarray for the monitoring of low concentration bio-molecules and pollutants. The project aims at the development of an innovative platform for the efficient detection of bio-molecules and of atmospheric particulate.</p> <p>The possibility of carrying out correlative analysis combining spectroscopic and microscopic / compositional information also represents an added value for fundamental studies of atmospheric particulate and of high sensitivity bio-sensing. This activity has also a clear applied interest due to the effects of fine nanoparticulate on health and climate, and in general for the possibility of</p>

implementing innovative approaches for the detection of very low concentration biomolecule signals.

The goal is the realization of a low cost microarray that allows to amplify the sensitivity of spectroscopies which are conventionally used to characterize molecules and compounds (Raman, Infrared, Photoluminescence). The amplification of the sensitivity will be induced by the concentration of the local electromagnetic field in presence of metal nanostructures which support localized plasmonics resonances. This activity will be carried out in collaboration with the Institute for Chemical and Physical Processes (IPCF) of the CNR of Messina, where the candidate will be required to spend part of his time in order to acquire specific skills in the field of nanospectroscopy.

The microarray will also allow to characterize in a co-localized way the atmospheric particulate with respect to its dimensional distribution (SEM electron microscopy) and to its atomic composition (X-EDS fluorescence measurements) with very low background signal. The characterization of atmospheric particulate will be carried out in collaboration with the company PM\_TEN srl.

The development of the project requires the acquisition of skills in the field of micro- and nano-manufacturing, in the growth and characterization of thin films and new materials, in the field of nanophotonics with particular reference to plasmonics and spectroscopies, and finally in the characterization of atmospheric particulate matter..

#### **Curriculum CHEMICAL SCIENCES AND TECNOLOGIES (CODICE 7308)**

##### **Project/scholarship No. 2: Valorization through innovative processes of the biomass produced by the treatment of civil and industrial wastewater.**

*Months abroad: 3*

*In cooperation with:*

- Tecnologie Innovative per il Controllo Ambientale e lo Sviluppo Sostenibile (TICASS)
- ACTIVE CELLS
- MICAMO
- IREN
- Polo Energia Ambiente Sviluppo Sostenibile (EASS)

*Project/scholarship details:*

In Europe the estimated annual production of wastewater sludge is about 10 Mt. The wastewater sludge not always are energetically valorized in order to minimize their environmental impacts. In a modern vision of "circular economy" the sludge from biological treatment plants due to their protein, cellulosic and fat content could be used as starting material for the extraction of compounds of interest or for the synthesis of compounds and materials according to principles of the Green Chemistry.

The main objective of the research is the development of innovative technologies that can lead to consider the sludge coming from the purification plants no longer as waste, but as the first or second raw material to be exploited as well as for its energy content especially for its organic fraction to be recycled and reused in order to obtain organic molecules, for example for fine chemicals.

The scientific research activity will be aimed at the study of innovative processes based on biotransformation of biomass as it is or after pre-treatment operations.

The research activity will be carried out on real biomass provided by the companies supporting the research project. Biomasses will be pretreated in order to make them more readily available for biological transformation processes through microorganisms, fungi or enzymes. In the study of the pretreatment, we will screen systems of both chemical and physical operations in different operating conditions of temperature, pressure and atmosphere and

	<p>presence of heterogeneous catalytic species.  For the biotechnological transformations, strains of microorganisms and fungi capable of bioconverting the biomass as it is or pretreated will be selected. The possibility of extracting biosurfactants and molecules of interest already formed during the pre-treatment processes will also be verified, also through the approach with advanced separation methods, such as membrane separation processes. Biomasses will be characterized from the physical and biological chemical point of view both as such and after the various phases of treatment and conversion.  Although most of the research doctorate will be carried out at the Department of Chemistry and Industrial Chemistry, the PhD student will have access to the structures of the companies involved in the project (Ticass, Iren, Micamo and Active Cells) in order to carry out analysis and evaluations necessary for achievement of the objectives of the research project.  The student will also have to spend a 3-month period abroad within an important academic or private research institute with expertise on biotechnology.</p> <p><b><u>Project/scholarship No. 3: Development of new processes and materials with reduced environmental impact applied to shipbuilding</u></b></p> <p><i>Months abroad: 6</i></p> <p><i>In cooperation with:</i></p> <ul style="list-style-type: none"> <li>- Istituto Italiano della Saldatura (IIS)</li> <li>- Istituto per lo Studio delle Macromolecole del Consiglio Nazionale delle Ricerche (CNR-ISMAC)</li> <li>- Polo Energia Ambiente Sviluppo Sostenibile (EASS)</li> <li>- Distretto Ligure delle Tecnologie Marine (DLTM)</li> </ul> <p><i>Project/scholarship details:</i></p> <p>The present project is focused on the development of new processes and on the study of eco compatible materials to be applied to the shipbuilding industry in order to produce high performance and lighter materials to build structures able to sustain heavier shipments in only one route.  Aluminum alloys with enhanced performance and optimum ratio weight/performance together with aluminum/steel hybrid structures are of great interest in this field.  The building processes actually used present several problems in their implementation. The developing of a new welding methodology is of peculiar importance in order to increment the productivity and the performance of maritime shipbuilding industry also giving more freedom during the design. Among all the existing possible solutions, the design of a hybrid welding system is the only candidate to this aim in order to bond steel and aluminum parts. The most promising candidate technique is the simultaneous use of Friction Stir Welding and the novel process of Hybrid Organic Bonding due to its low cost and fast implementation in comparison with the techniques nowadays used.  The activity will be focused on:</p> <ul style="list-style-type: none"> <li>-Exhaustive bibliographic research on commercial adhesives for state of the art references</li> <li>-Screening of the most promising candidate for hybrid weld bonding after optimizing their formulations</li> <li>-Use of additives in order to enhance the curing and mechanic properties of the commercial products by means of curing enhancer, stabilizers, inorganic charges and/or flame retardants</li> <li>-Exhaustive characterization of the materials after curing and evaluation of their performance</li> <li>-Kinetic Characterisation via isothermal and non-isothermal techniques, study of the curing and their correlation with theoretical models.</li> </ul>
<b>PhD FUNDING</b>	The annual gross amount of the grant, including social security expenses to be paid by the recipient, is € 16,500.00.

	<p>The amount of the doctoral grant shall be increased by 50% for an overall period of not more than 18 months, if the graduate student is authorized to by the teaching body to carry out research abroad.</p> <p>Starting from the first year, each graduate student will have, besides the grant, a budget for research activities in Italy and abroad which will not be less than 10% of the grant.</p>
<b>ADMISSION REQUIREMENTS</b>	
<b>COURSE ADMISSION</b>	Admission is subject to the passing of the selection tests and is conditioned by the positive outcome of the medical examinations, where required, that are carried out in health facilities and aimed at ascertaining the suitability for the specific task in accordance with D. Lgs. No. 81/08.
<b>REQUIRED QUALIFICATION</b>	Degree which has been conferred according to the rules and regulations in force prior to the reform of didactic freedom in universities, or a specialist/II level degree or an equivalent foreign academic qualification.

<b>SELECTION PROCESS</b>	
<b>SELECTION COMMITTEE</b>	The committees are made up of at least 3 university professors for each course; they may be integrated by not more than 2 experts, who may also be foreign nationals, from public and private research institutions and structures.
<b>ADMISSION TEST VENUE</b>	Università degli studi di Genova, Department of Chemistry and Industrial Chemistry (Dipartimento di Chimica e Chimica Industriale – DCCI), via Dodecaneso 31, Genova.
<b>TYPE OF ADMISSION TEST</b>	<ul style="list-style-type: none"> <li>• Comparative assessment of the qualifications/publications.</li> <li>• Written test (research project).</li> <li>• The interview consists in the discussion of the written test (research project) and the description of the candidate's research area of interest, also on the basis of previous activities stated in his/her scientific-professional curriculum</li> </ul> <p>The tests are focused on confirming the candidates' aptitude for scientific research.</p>
<b>METHODS FOR INVITING THE CANDIDATES AND COMMUNICATING THE OUTCOMES OF THE TESTS</b>	<p>The <b>examination schedule</b> is as follows:</p> <ul style="list-style-type: none"> <li>• Evaluation of qualifications, curriculum and written test (research project): <b>25.7.2018</b></li> <li>• Interview: <b>27.7.2018, 9.00 am</b>, at Dipartimento di Chimica e Chimica Industriale (DCCI), room 3.</li> </ul> <p><b>Candidates can use video conference mode; and, for identification purposes, the candidate must show the original document of which he has deposited a certified copy at the time of application.</b></p> <p>The <b>list of those admitted to the interview</b> will be affixed at the Dipartimento di Chimica e Chimica Industriale (DCCI).</p> <p>The <b>final lists</b> shall be announced on <b>10<sup>th</sup> August 2018</b>, and will appear solely on:</p> <ul style="list-style-type: none"> <li>• the noticeboard of the relevant research Departments/facilities for the research courses;</li> <li>• the noticeboard of the University;</li> <li>• on the Internet address <a href="https://unige.it/usg/it/dottorati-di-ricerca">https://unige.it/usg/it/dottorati-di-ricerca</a></li> </ul> <p>No information whatsoever shall be posted to candidates' domicile.</p>
<b>WRITTEN TEST</b>	The research project (10 pages maximum) has to be attached to the online

	<p>application form, and it must concern one or more research Projects/grants highlighted in the section 'TRAINING PROJECT'.</p> <p>The research project will be evaluated as practical test for the selection, together with the evaluation of the qualifications and the scientific-professional curriculum, in order to identify the candidate's aptitude for scientific research in terms of originality, feasibility, clarity in the definition of objectives, methods and expected results.</p>
<b>INTERVIEW</b>	<p>The interview consists in the discussion of the written test (research project) and the description of the candidate's research area of interest, also on the basis of previous activities stated in his/her scientific-professional curriculum</p> <p>During the interview, the candidate shall also prove his/her proficiency in the following foreign language: English.</p> <p>Non-Italian candidates will also have to prove knowledge of the Italian language.</p>
<b>PERCENTAGE VALUES OF TO EACH TEST</b>	<p>To each candidate can be assigned a maximum of 150 points, divided as follows:</p> <ul style="list-style-type: none"> <li>- comparative assessment of the qualifications/publications: max score 30/30, pass mark 20/30.</li> <li>- Written test (research project):max score 60/60, pass mark 40/60.</li> <li>- Interview: max score 60/60, pass mark 40/60.</li> </ul> <p>The final ranking will be drawn up by adding the scores assigned in comparative assessment, written test and interview.</p> <p>Candidates will be selected in compliance with the principles of equal opportunities.</p>
<b>ADDITIONAL CRITERIA FOR ADMISSION TO THE COURSE</b>	<p>In the case of equal grades, the evaluation of candidates' incomes prevails for the assignation of grants, as per D.P.C.M. 9 April 2001</p>
<p><b>PROJECT CO-FINANCED BY THE EUROPEAN UNION</b></p> <p><b>Regional Operational Program for Liguria - European Social Fund 2014-2020</b></p>	