

# **2010 open PhD positions at the Materials Science and technology group University of Rome “Roma Tre”**

The Materials Science and technology group (STM-DIMI) is an interdisciplinary research group within the Mechanical and Industrial department of “Roma Tre” University, mainly working on material science and technology development in the field of surface engineering and thin coatings for advanced mechanical and MEMS applications.

In the frame of two ongoing research projects dealing with the development of new methodologies for the mechanical characterization of small scale systems (thin films, MEMS structures, nanostructured multiphase materials) we are looking for highly motivated PhD Student candidates on the following topics:.

## **1. *“Nano-mechanical characterization and 3D residual stress measurement at the microscale by combining FIB-DIC and nanoindentation techniques”***

This project aims at the development of a procedure for the measurement and control of mechanical properties (strength, toughness, fatigue resistance, etc.) and residual stress in nano-structured materials (e.g. nano-composites and thin coatings) and small-scale devices (e.g. MEMS/NEMS).

Research activities will be based on the combined and synergic application of nano-scale mechanical characterization techniques, high resolution microscopy (FIB-SEM-TEM) analysis and microstructural modelling of the produced devices.

The research activities will be focused on the study of the elastic, plastic and time-dependent deformation as well as degradation mechanisms like fracture, fatigue and wear at small scales, by exploring the new possibilities given by new testing methodologies, e.g. in situ measurements.

## **2. *“Multi-Functional coatings having wear resistance and anti-skid properties coupled with photo catalytic and anti bacterial properties”***

This project aims at the development of advanced and integrated methodologies for the characterization of innovative multifunctional coatings for application in “Made in Italy” products.

The experimental activities will be focused on the study and development on photocatalytic TiO<sub>2</sub>-based coatings, obtained by sol-gel techniques (in case of ceramic substrates) and anodic oxidation (in case of titanium alloy substrates). The use of ultra-fine particle dispersions will be evaluated, with the aim of adding new functionalities to the coatings, such as improved hardness and scratch resistance.

The research approach will require the advanced use of high resolution microscopy techniques (FIB/SEM-FEG, TEM, AFM), X-ray photoelectron spectroscopy (XPS), non-contact profilometry, nanoindentation, nano-scratch and nano-wear testing, also under controlled environment and or UV irradiation.

Candidates should have (at least):

- Good knowledge of principles of mechanics of materials and conventional mechanical testing;
- Basic or Intermediate knowledge of Surface Engineering and surface advanced characterization techniques (XRD, XPS, profilometry, AFM)
- Basic or Intermediate knowledge of electron and ion microscopy techniques (SEM, TEM, FIB);
- Basic knowledge of Nanoindentation testing;
- Basic knowledge of Digital Image Correlation techniques;
- Intermediate or Good knowledge of programming in Matlab SW environment
- Excellent knowledge of English, both spoken and written

The ideal Candidate (m/f) is a communicative experimental material scientist, mechanical engineer or physicist, or a related discipline, with at least a Master’s degree (or equivalent).

The work will be carried out under supervision of prof. Edoardo Bemporad and his colleagues both at the STM-DIMI labs ([www.stm.uniroma3.it](http://www.stm.uniroma3.it)) as well as at the interdepartmental laboratory of electron microscopy of university of Roma Tre, Rome, Italy (<http://www.lime.uniroma3.it>).

The position will be available starting from January 2011.

The planned PhD course duration is three years; PhD work will be defended in front of an International Committee.

***Please send your complete application (English) including project of interest (#1 or #2), CV, exam certificates, list of publications as well as names and addresses of at least two academic references to prof. Edoardo Bemporad, by end of August 2010 for a pre-screening.***

Only complete applications will be evaluated; preferred Curricula will be advised for the official selection (to be performed in September). Official info (in Italian) at: <http://host.uniroma3.it/uffici/ricerca/default.asp>