



VIU

**Venice
International
University**

Isola di San Servolo
Venezia - ITALY

July 11 – 18, 2010

2nd International School on
***Laser-surface interactions for new materials production: tailoring
structure and properties***

The purpose of the School is to offer a comprehensive overview on basic principles and relevant applications connected to the irradiation of solids by energetic laser beams. The goal is to explore the use of light in the development of novel materials with emphasis on specific control of their properties at nanometer scale. The field is relatively young and has grown at a very high rate in the last fifteen years, thanks to worldwide research activity. One area of very high interest is the use of lasers in deposition processes; it is possible, for example, to deposit virtually any material, including multi-component compounds, preserving the composition of the ablated target, and generally avoiding post-deposition thermal treatments. In addition, the experimental setup involved in pulsed laser deposition is generally compatible with in situ diagnostics of both the plasma and the growing film. The basic laser-surface interaction mechanisms possibly in an ambient atmosphere, either chemically reactive, or inert are a challenge to scientists, while engineers are mostly interested to the characteristics of the deposited materials and to the

possibility to tailor their properties through an appropriate tuning of the deposition parameters.

In addition, lasers can be used to modify materials in a highly controlled fashion; this includes both bulk and surface modification. Examples include production of surface nanostructures as well as nanoparticles (both bulk and surface). These laser-induced changes can strongly influence the optical and electronic properties of the irradiated material. Finally, a wide range of applications and characterization techniques involve understanding on a very basic level the interaction mechanisms. Plasmonics is one blossoming field requiring such knowledge.

Among the hot topics developed in recent years are ultra-short laser pulses to explore electronic excitation in solids and its relaxation with phonons in highly non equilibrium conditions, the synthesis of nanoparticles and their assembling to prepare nanocrystalline films and the deposition of metastable systems.

Well established International Conferences bring together every year many researchers in the field allowing for extensive scientific exchange. Based on the success of the First edition of the School, the Second is now scheduled with the explicit aim to educate doctorate students in the principles of laser-surface interactions especially in connection with the ablation processes and materials modification.

The proposed one-week School will focus on the deep interplay between experimental and theoretical investigations of laser-induced surface phenomena. The topics include laser-surface and -bulk interactions, the role of defects, non-linear absorption phenomena, surface melting, vaporisation, superheating, homogeneous and possibly heterogeneous nucleation, phase explosion and plasma formation, nanosecond and femtosecond laser pulses, film synthesis by pulsed laser deposition, nanoparticle nucleation, growth and assembling of nanocatalysts relevant to renewable energies and to the ambient, the fate of electrons and displaced atoms/ions in excited solids. The classes of considered materials span the entire realm of technological interest and include metals, semiconductors, and wide bandgap insulators. The main experimental techniques to characterize solids and surfaces before, during, and after irradiation, the plasma plume and the deposited film will be addressed. The true interdisciplinary nature of the School will help promoting fruitful interactions between researchers from such diverse fields as solid state and plasma physics and chemistry, materials science, metallurgy, ceramic, and polymer science.

We expect junior researchers will particularly profit from the proposed initiative.

The recognised success of the First edition of the School (directed by A. Miotello and P.M. Ossi) encouraged the Scientific Committee to plan the Second edition in the same place and maintaining the same scientific and organisation structure as that of the First edition. The facilities of Venice Intl. University demonstrated to be excellent and S. Servolo island is a beautiful, quiet garden that facilitates positive interaction among participants, yet it is a few minutes far from S. Marco Square and the very centre of Venice with its exciting cultural and recreational life, in the heart of the summer season.

The School is planned for about 50 students. Attention will be given to keep a truly international character of the event, also through a selection of the participants.

The School Directors

C. Boulmer-Leborgne

M. Dinescu

J.T. Dickinson

P.M. Ossi

Organisation issues

To stimulate the scientific interactions both between Lecturers and students, the following timetable will be adopted:

9.00 – 10.30 : lecture

10.30 – 11.00 : informal discussion

11.00 – 12.30 : lecture

lunch time

14.30 – 16.00 : lecture

16.00 – 16.30 : informal discussion

16.30 – 18.00 : lecture/ posters

Each student is asked to bring a poster with recent relevant results of his research activity. All the posters will be exhibited on the first day and they will be removed at the end of the School.

Two poster sessions are scheduled and awards will be given for the best posters.