



Scientific Report

on the execution of the project 269/5.10.2011, cod CNCSIS PN-II-ID-PCE-2011-3-0650, for the period January – October 2013

Title: The study of polymer-laser radiation interactions in controlled atmosphere. Laser ablation nanostructured thin film layers. Applications

General objective:

- Study of the nanosecond and femtosecond laser ablation plasma
- Study of the laser ablation plasma dynamics by using metallic targets

In order to reach these objectives, the next activities were performed:

- A. The influence of the laser pulse width on the ablation plasma was investigated;
- B. Transient plasma specific spectral techniques and ultrafast ICCD imaging were used for the characterization and space-time resolving of the laser ablation plume;
- C. Electrical oscillations appearing in the electronic circuits of some electrodes (targets, walls, probes, etc.) placed near the laser ablation plume under its incidence were investigated;
- D. The influence of the different materials (target type) on the dynamics of the laser ablation plume was investigated. The results were compared with those obtained in the study of stationary plasmas, related to the inhomogeneous plasma configurations with non-monotonous potential structure. These structures were identified as double layers and multiple double layers, respectively, depending on the experimental conditions.

During this research, techniques and methods for obtaining and characterization of technologically interest materials were developed, while the obtained results were published in ISI quoted journals and disseminated to national and international conference as oral, poster or invited contributions, as follows:

ISI Articles

1. G. Dascalu, G. Pompilian, B. Chazallon, O. F. Caltun, S. Gurlui, C. Focsa, *Femtosecond pulsed laser deposition of cobalt ferrite thin films*, Applied Surface Science, Volume 278, p. 38-42 (2013)
2. S. Gurlui, G. O. Pompilian, P. Nemec, V. Nazabal, M. Ziskind, C. Focsa, *Plasma Diagnostics in Pulsed Laser Deposition of GaLaS Chalcogenides*, Appl. Surf. Science, 278, p. 352-356 (2013)
3. D. G. Dimitriu, M. Aflori, L. M. Ivan, V. Radu, E. Poll, M. Agop, *Experimental and theoretical investigations of plasma multiple double layers and their evolution to chaos*, Plasma Sources Sci. Technology, 22, 035007 (2013) doi:10.1088/0963-0252/22/3/035007

Invited Lectures

1. S. Gurlui, P. Nica, M. Agop, M. Osiac, C. Focsa, Peculiar Behavior of Plasma Plumes Generated by Femtosecond Laser Ablation of Metallic Targets, 12th International Conference on Laser Ablation, 6-11 October 2013, Ischia, Italy (O-09).
2. S. Gurlui, P. Nica, M. Agop, M. Osiac, C. Focsa, Two-Temperature Plasmas Generated by Femtosecond Laser Ablation of Metallic Targets, 16th International Conference On Plasma Physics And Applications, June 20-25, 2013, Magurele, Bucharest, ROMANIA
3. C. Focsa, S. Gurlui, High Technological, Potential Materials, Explored by Laser, Ablation, The 5-th National Conference of Applied Physics, MAY 23 - 24, 2013, Iasi, Romania

National and international conferences

1. O. G. Pompilian, G. Dascalu, I. Mihaila, S. Gurlui, M. Olivier, P. Nemeč, V. Nazabal, N. Cimpoesu, C. Focsa, Pulsed Laser Deposition of Gallium Lanthanum Sulphide Chalcogenide Thin Films, 12th International Conference on Laser Ablation, 6-11 October 2013, Ischia, Italy (P2-69);
2. O. Niculescu, M. M. Cazacu, M. N. Dănilă, D. G. Dimitriu, S. Gurlui, M. Agop – Magnetosphere double layers and aurora borealis. Acceleration mechanisms and instabilities, *Environmental Legislation, Safety Engineering and Disaster Management (ELSE DIMA)*, Cluj-Napoca, Romania, 2012;
3. S. Gurlui, O. Niculescu, D. G. Dimitriu, C. Ionita, R. Schrittwieser – Spectral investigations of two simultaneous fireballs in plasma, *Physics Conference TIM-12*, Timisoara, Romania, 2012;
4. O. Niculescu, S. Gurlui, D. G. Dimitriu, C. Ionita, R. Schrittwieser – Optical Emission Spectroscopy and Nonlinear Dynamics Analysis of Two Fireballs Simultaneously Obtained in a Cold Diffusion Plasma, *31st ICPIG*, July 14-19, Granada, Spain, 2013;
5. O. Niculescu, S. Gurlui, D. G. Dimitriu, C. Ionita, R. Schrittwieser – Study on the Interaction of two Complex Plasma Structures. Optical Emission Spectroscopy and Nonlinear Dynamics Analysis, *PLASMA-2013*, September 2-6, Warsaw, Poland, 2013.

**The published ISI articles are annexed.
All the proposed objectives were fulfilled.**

12 October 2013

Manager project,
Assoc. Prof. PhD. Silviu GURLUI

