

Preface

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Present proceedings are the result of the conference which took place at Kudowa Zdrój, Poland, during the period November, 22–26, 1999. It was organised in the framework of INCO-COPERNICUS Contract #ERB IC-15-CT98-0811 (Concerted Action). This activity is devoted to the co-ordination of efforts in the elaboration of the ecologically clean high power sources of hard radiation and in their application for material sciences. Representatives of the majority member-laboratories on the Project (Ferrara University, Italy; Ruhr University, Germany; Institute of Plasma Physics and Laser Microfusion, Poland; Lebedev Physical Institute and Institute of Metallurgy and Material Science, Russian Academy of Sciences, Russia; Tallinn Pedagogical University, Estonia) presented their reports to this Meeting. Several guests and observers working (or just interested) in the field were invited to take part in it: Soltan Institute of Nuclear Studies, Poland; Research Institute of Nuclear Physics, Moscow State University, Russia; Kharkov Physical-Technical Institute, Ukraine; University of Nouakchott, Mauritania.

The papers are connected with the main issues to be resolved by this project during the period of 3 years. These problems are as follows:

- to design, construct and put into operation a new generation of the ecologically acceptable high power plasma devices based on the dense plasma focus (DPF) installation; in particular the greatest in the world working on deuterium PF-1000 (Poland) and a set of small high efficiency high rep rate DP *foci*, transportable and even portable ones (Russia); side by side with this main goal participants should adjust the already available devices for the aims of the Project;
 - to elaborate new technologies based on the above devices for the improvement of the materials with the help of their irradiation by high power hard radiation of various types;
 - to design and manufacture various specimens of advanced materials having high properties in comparison with presently available for their use within the above technologies;
 - to prepare necessary diagnostics for the investigation of the process of plasma and ion streams interaction with condensed matter samples as well as for the monitoring of the parameters of the irradiating streams;
 - to apply an adequate analytical equipment for the investigation of the irradiated samples of the above mentioned perspective materials;
 - to elaborate a theory of the whole chain of the processes under investigation:
 - optimisation of generation mechanisms of the high temperature fast plasma streams as well as ion/electron/X-ray/neutron beams in the DPF,
 - transportation of these streams up to the target,
 - stream-target interaction,
 - dynamics, modification and destruction of the irradiated condensed matter samples.
- DPF devices used in the Project cover a very broad range of their power supply (energy stored in capacitor banks) – from 100 J up to 1.2 MJ. Each specimen materials to be irradiated can be positioned inside the DPF chamber either in an anode or in a cathode side of the DPF chamber and at different distances from the region of streams generation. Accordingly between different issues within the frame of the Project three main aims related to material sciences are under a special investigation:
- material characterisation (element composition of the samples, its structure and finally its properties),
 - materials specimen modifications (surface and bulk),
 - destruction testing of radiation resistive materials and investigation of character and mechanisms of its disintegration.
- We expect to receive main results at the third sphere of researches by using our largest DPF installation – PF-1000 that is just at the moment in the initial stage of its operation after a set of conditioning shots. Yet some data on this point

have been received already with another relatively small devices, e.g. with DPF of Filippov geometry of its electrodes having energy about 60 kJ (a section of TULPAN installation, Lebedev Physical Institute).

During the Workshop Prof. L. I. Ivanov (A. A. Baikov

Institute of Metallurgy and Material Science, RAS) has presented two review reports: "Modification of materials characteristics under the action of pulsed power streams" and "Problems of ion implantation of materials". Unfortunately these papers have not been included in the Proceedings, and will be published elsewhere later on.