The current state of new ion beam and plasma facility for material synthesis, modification and analysis

Jozef Dobrovodský, Robert Riedlmajer, and Lucia Bónová

Advanced Technologies Research Institute, Faculty of Materials Science and Technology in Trnava of the Slovak University of Technology in Bratislava, J. Bottu 23, 917 24 Trnava, Slovakia

The new ion beam and plasma laboratories for advanced materials research are currently in the phase of finalization at the Faculty of Materials Science and Technology STU in Trnava. They are built within the project Üniversity Park Campus MTF STU -CAMBO"funded by European Regional Development Fund - Research and Development Operational Programme. The new technologies create conditions for the implementation of basic and applied research in the physical and material engineering including nanotechnology research, as they enable e.g. synthesis, modification and analysis of surface, subsurface and thin layers of solid states. The key technologies and facilities are briefly described, including some typical and/or possible examples of their applications.

The Ion Beam Laboratory is equipped by 6 MV Tandetron - tandem ion accelerator and by 500 kV ion implanter: a/ Two end stations of the 6 MV Tandetron are designed for ion implantation and ion beam analysis, respectively. The energy range from 600 keV up to 50 MeV for heavy multi-charged ions can be reached. Ion Beam Analysis (RBS, channeling, ERDA, PIXE, NRA) can provide for instance depth profile of elemental composition in the range from the surface to the depth of few microns of the samples, trace element analyses, etc.. b/ The 500 kV ion implanter has two end stations for ion implantation and experimental work as well.

The main systems of the Plasma Laboratory are the following: c/ Plasma-immersed ion-implantation apparatus for vacuum deposition and ion implantation with 20 kV bias for flat substrates. d/ Plasma-immersed ion implantation apparatus for plasma-immersion ion implantation and deposition with 40 kV bias system for material treatment and hard coatings of 3D-substrates. e/ DC pulsed magnetron sputtering system three magnetrons, conventional 1 kW DC. f/ Pulsed DC sources RF sputtering system with substrate bias, magnetrons with RF sources. Plasma immersion ion implantation PIII can be applied for synthesis of silicon on insulator, for shallow junction formation by plasma doping, trench doping, as well as for plasma doping and plasma surface modification of biomaterials and diamond-like carbon materials, etc.

The current state of mentioned facilities installation is presented. The completion of laboratories will be by the end of 2015.

This work was supported by the ERDF - Research and Development Operational Programme under the project Üniversity Scientific Park Campus MTF STU - CAMBOÏTMS: 26220220179 and by H2020-EU.4.a. project No. 664526, WIDESPREAD-1-2014 – Teaming: Slovak Centre of Excellence in Ion Beam and Plasma Technologies for Materials Engineering and Nanotechnology – SlovakION.