CHARPAN
CHARGED PARTICLE NANOTECH
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Number of partners: 18 from 11 countries (5 industry, 5 research, 4 higher-education, 3 INCO, 1 administrative support)

CHARPAN project

The IP proposal CHARGED PARTICLE NANOTECH (CHARPAN) focuses on the research and development of a new production technology for nanotechnology devices. In particular, CHARPAN enables low cost engineering of complex 3D surface structures with nanometre precision. No such accurate fabrication technology exists to date.

The main innovation of this new technology is the flexible use of different ion species and the 200x reduction optics leading to direct structuring power at high throughput.

The key challenges will be to realise the massive parallelism retaining ultimate resolution down to the nanometre scale, while minimising throughput-resolution trade-offs.

Description of the system

The innovative core of the system is an ion optical column comprising an ion source (Ar+, optional: H+, He+, Xe+ and other ions), a condenser system to form a parallel broad charged particle beam, a programmable aperture plate to structure the beam, and a 200x reduction optics to reduce the shaped beam to form a high resolution high intensity charged particle beam (see Figure 1).

One of the key advantages of CHARPAN is the improved surface precision capability, including lowest surface roughness (<5 nm, depending on the starting material and feature depth), excellent edge definition at aspect ratio of 2-3 (defined as ratio of feature depth to width). Higher aspect ratios up to 20 will be achieved by using reactive precursor gases. The use of ion induced gas assisted etching is well known from focused ion beam processing. The gases lead to an enhanced material removal by increasing the etching rate and decreasing the re-deposition rate of sputtered substrate atoms. For example XeF2 is used to etch Si and SiO2. Further, the versatile CHARPAN tool offers the flexibility to process a wide range of materials (metals, silicon, glass, ceramics, polymers) down to 25 nm feature range. The ultimate resolution limit will be clearly below 10 nm.

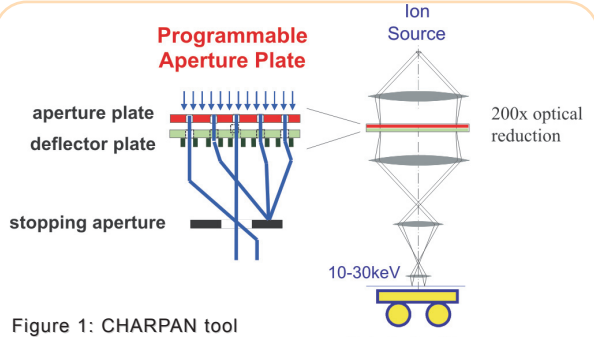

Figure 1: CHARPAN tool principles (public)

CHARPAN applied for nano-scale pattern transfer is deploying a parallel structured beam, removing any material along the beam direction. Also electrons can be used to drive chemical reactions on the substrate in presence of reactive precursors. Typical ion sputter removal rates are approximately 1-10 sputtered atoms per incident ion and are varying within a factor of 5 to 10 for different materials. If precursor gases are used, removal rates can be increased to more than 20 atoms per incident ion. The sputter rate also depends on the kinetic energy of the ions and reaches maximum values for energies that are in the same order of magnitude as used with CHARPAN.

Application of CHARPAN tool

In the short term, the CHARPAN will be applied primarily for 2D and 3D template fabrication, device prototype manufacturing and nanotechnology research. On long term, CHARPAN is seen as key technology for emerging nanotechnology applications in an industrial environment. Besides sputtering, the versatile CHARPAN technology offers several other beam induced patterning processes, such as beam assisted etching, deposition, polishing, nano-meter resolved ion implantation and ion mixing. These processes are regarded to be fundamental for a large number of future CHARPAN applications.

***Romanian partner*:The International Centre of Biodynamics**, **www.biodyn.ro**, Director **Eugen Gheorghiu, gheorghiu@biodyn.ro.**

RAINS
Romanian Action for Integrating, Networking and Strengthening the ERA
FP6-2004-ACC-SSA-2

"Petru Poni" Institute of Macromolecular Chemistry (PPIMC), Iasi, Romania

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Financial Manager - **Raluca Andone;**

The strategic objective addressed by RAINS project: reinforcement of the research capacity of Romania (one of the target associate candidate countries). More specifically, RAINS is aimed to consolidate the research potential of an outstanding Romanian research centre - the "Petru Poni" Institute of Macromolecular Chemistry (PPIMC) in the 3 NMP area of 6th FP by:

• increasing the networking between PPIMC and RTD regional/ national and European partners;
• enhancing the participation of PPIMC and its Romanian partners in the 6th Framework Programme;
• diminishing "brain drain" phenomena by increasing job opportunities and offering better carrier opportunities

Specific and measurable objectives:

Modernising the administrative structure and working environment within PPIMC

• Define and implement a modern organization/management system for PPIMC as a key action for the future development of the Centre by creating three new support offices (WP4)
• Improve the working and living conditions of PhD students and young scientists in an attempt to reduce the 'brain drain'

International Evaluation and Development Strategy of PPIMC

• Re-define the profile of PPIMC through independent analysis/ evaluation and internal analysis in order to achieve wider recognition at both national and international levels from the analysis/evaluation process (WP1 and all other WP's)
• Agree on a coherent strategy for the long-term development of the institute and subsequent full integration into ERA by implementing new ideas and recommendations issued

PPIMC Research Integration and Networking

• Increase the participation of PPIMC in European and international R&D programs
• Enlarge and strengthen the already existing PPIMC Cooperation Network at national and international levels
• Support the integration of local/national traditional and new partners of PPIMC in view of EU enlargement

Improving PPIMC Research Capacity

• Strengthen centre capacity for top level research through in-house and external training programmes and by upgrading /renewing the S&T research equipment
• Increase the attractiveness of research careers for young scientists including PhD students by designing new curricula and increasing job opportunities

Dissemination of project results

• Promote the achievements under the RAINS Project through website, conferences, workshops and media coverage
• Strengthen the connection with business media in order to increase the RTD potential of the NE Romanian Region and of the country
• Share the knowledge and skills acquired including the use of new equipment with regional partners
• Improve the perception of general public towards science and chemistry by organizing 'Open Days', publishing articles dedicated to the general public, media interviews
• Increase awareness of women on their socio-professional role and on the opportunities offered by FP6.