

# POLINNOVA

The FP7 POLINNOVA project aims at strengthening the research and innovation potential of the Institute of Polymers at the Bulgarian Academy of Sciences, as co-ordinator Dr Neli Koseva explains

The Institute of Polymers at the Bulgarian Academy of Sciences has undertaken the POLINNOVA project in response to the objective of the EU's FP7 Capacities Programme, and its specific area of interest in research potential that contributes to the development of an open and competitive European Research Area. The work programme was designed to unlock the potential of existing or emerging excellence in the EU's convergence regions and outermost regions. In 2012 an emphasis on the implementation of the Innovation Union initiative was added – research and innovation as integrated drivers of sustainable growth and social progress. This broader approach affords support to the research centres keen to increase their innovation potential.

Europe has identified, as a key point, the importance of materials science and the need for better fundamental understanding of materials and their behaviour, and its relevance to virtually all needs of modern society. Polymers constitute an extremely large class of materials. They afford a great number of molecular architectures and compositions, supramolecular structures, the possibility for modification, blending, processing and recycling. As a class of materials, they continue to evolve with further advances in both performance and applications. Polymers are used for energy storage materials, in electronics, communication and transportation, in medicine, pharmacy and cosmetics, in agriculture and the food industry. Nanotechnology in combination with polymer materials engineering is expected to give new impetus for an innovative materials design and expanded applications, thus contributing to the economic growth and life quality.

## The project objective

POLINNOVA is a 42-month project that commenced in October 2012 with co-ordination by the Institute of Polymers at the Bulgarian Academy of Sciences (IP-BAS). The project was granted within the FP7 Capacities – Research Potential Programme (GA No 316086). The main goal of the project is to strengthen the IP-BAS research and innovation potential in the field of advanced polymer materials and to build its capacity of a regional leader participating successfully in activities at the European Union level. The key concept is to implement an action plan, derived from a complete SWOT analysis and synchronised with the specific objectives of the call (FP7-REGPOT-2012-2013-1). The action plan includes four coherent measures that determined the activities planned in the project.

## The institute

The Institute of Polymers is a beneficiary and also acts as co-ordinator of the project. It belongs to the Nanosciences, New Materials and Technologies division of the Bulgarian Academy of Sciences. The mission of IP-BAS is to do advanced research on

polymers and polymer materials and to transform the generated knowledge into innovative materials, products, technologies and services in response to the needs of industry and society.

The principal scientific strength of IP-BAS is the vast knowledge associated to various methods for polymer synthesis. The research includes interrelated investigations concerning precise synthesis, modification and characterisation of polymers and the development of new polymer materials that creates the strong knowledge base for frontline and application-oriented research. The research is focused on: materials for pharmacology and medicine; materials for biotechnology, agriculture and food preservation; electroconductive and photoactive materials; and materials for energy and environmental purposes.

IP-BAS is a centre of excellence for new polymer materials for medicine and pharmacology. The targeted results are creating a favourable environment for intensifying the research and use of the generated knowledge, the education of PhD students, and promoting the professional level of the researchers. The achievements of IP-BAS in that interdisciplinary field include polymer-based systems for controlled drug delivery and wound healing, polymer-drug conjugates, new therapeutic systems based on polyphosphoesters, 'smart' nanoparticles for targeted drug delivery, stimuli-responsive hydrogels and self-assembled structures, stabilised micelles and liposomes, nanofibrous and nanohybrid materials amongst others.

The research output of IP-BAS is internationally competitive. The publication rate is close to the European average for the field and IP-BAS publishes in first rank journals in the areas of chemistry, polymer and materials science. The rate of citations suggests a wide and solid acceptance of the results of IP-BAS by the international community.

IP-BAS has established fruitful collaborations with prominent research centres in the country and abroad. The institute has intensified joint investigations with organisations specialised in fields other than polymer science such as medicine, pharmacology, biotechnology and agriculture, resulting in a number of interdisciplinary projects. IP-BAS is a co-founder of the Central and East European Polymer Network which is an informal association of polymer institutes and polymer groups affiliated to national academies of sciences in eight Central and Eastern European countries.

## SWOT analysis

The SWOT analysis was based on two external evaluations of IP-BAS research performance. Within the FP7 project PASSPORT (FP7-REGPOT-2007-2), the research quality and infrastructure of

IP-BAS were evaluated by three independent experts nominated by the European Commission. In 2009, ESF and ALLEA conducted an evaluation of the research units of BAS in response to a request by the academy to measure its position as the premier research organisation in the country against the standards of international scientific competitiveness. IP-BAS was given high scores for socioeconomic impact underlining its research policy being coherent with the key objectives for sustainable development of Bulgaria as an EU member state. Both reports emphasised the good management and enthusiastic young generation of researchers of the institute which make it an entity with outstanding prospects for development.

### Project activities

#### ■ Twinning with leading European research centres through the exchange of knowledge, experience and know-how

The activity aims at intensifying joint research and increasing the density of networking with organisations highly experienced and knowledgeable in specific areas of polymer materials. Improvement and diversifying the qualifications of the research staff is expected through stimulating trans-national and trans-disciplinary mobility. The programme of exchange will be realised with six twinning research organisations.

#### ■ Reinforcement of human resources

Recruitment of experienced researchers and technicians is planned. In parallel to the increasing of IP-BAS human potential, the project is facing the problem of brain drain. In this context experienced Bulgarian scientists who relate their future and career development with a return home are a targeted group.

#### ■ Enhancement of the research infrastructure

This activity is focused on the enhancement of the S&T capacities for innovative research in the polymer opportunity areas by upgrading the existing technical equipment and acquiring new modules and instruments. The modernised scientific infrastructure will provide opportunities to benchmark with the research standard of leading centres in the EU.

#### ■ Unlocking the innovation capacity of IP-BAS

Research excellence focused on innovations and creativity will be achieved by setting up an education and training scheme in entrepreneurship and innovation management; exchange of experience with the twinning organisations and adopting good practices in the commercialisation of research results, encouraging comprehensive stakeholder debates on innovations involving scientists, industry, consumers and public authorities. A strategic plan for intellectual properties development and building the innovation capacity of IP-BAS will be prepared.

#### ■ Dissemination and communication activities

The main goal is to increase the visibility of IP-BAS excellence and the awareness of society about its achievements by dissemination, marketing and promotion of IP-BAS results and the added value of the project. The dissemination and communication activities aim to reach out to interested parties from academic circles, industry, stakeholders as well as the general public.

#### ■ Evaluation of IP-BAS research potential and innovation capacities upon POLINNOVA completion

This will provide an evaluation analysis by international independent experts of the overall research quality and innovation potential (including management and research infrastructures) at the end of the POLINNOVA project. That will also indicate the path to improved IP-BAS research facilities for increased contribution to regional economic and social development. The ex-post evaluation will facilitate the actualisation of the action plan for IP-BAS sustainable progress in advanced polymer materials research, development and innovations. That will also extend the positive impact of the POLINNOVA project.

### Partnering organisations

The partnering organisations have internationally recognised high level scientific backgrounds in polymer science, considerable knowledge in the relevant fields and also significant experience in EU projects. It is noteworthy that the network includes experts in the main fields of polymer science – from modern polymer synthesis and investigation to the development of advanced materials and technologies for specific applications.

#### The following organisations have been involved:

- Polymer Chemistry Research Group, Ghent University (Belgium);
- Center of Innovation and Research in MAterials & Polymers, University of Mons (Belgium);
- Theoretical and Physical Chemistry Institute, National Hellenic Research Foundation (Greece);
- Centre of Polymer and Carbon Materials, Polish Academy of Sciences (Poland);
- Institute for Chemical and Environmental Technology, University of Castilla-La Mancha (Spain);
- School of Pharmacy, University College London (UK);
- Bulgarian Association Polymers (Bulgaria).

### The advisory board

The advisory board of the project is composed of renowned European scientists. Their role is to assist the management group of POLINNOVA to formulate and update the research strategy, discuss the prospects for upscaling of IP-BAS potential, and to watch for the sustainability of the IP-BAS research agenda beyond the project's end as well. The advisory board includes: Prof Dr Steve Brocchini (UK), Prof Dr Philippe Dubois (Belgium), Prof Dr Filip Du Prez (Belgium), Prof Dr Hab. Andrzej Dworak (Poland), Prof Dr José M. Kenny (Italy), Prof Dr Sebastien Lecommandoux (France), Prof Dr Klaus Müllen (Germany), Prof Dr Stergios Pispas (Greece), Prof Dr Juan Francisco Rodrigues (Spain).



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