

The Department of Materials Engineering (DEMATEN) at the Faculty of Technology, University of Novi Sad (FTUNS) represents the strongest research and education centre in the province Vojvodina in the field of ceramics and polymer materials and one of the first research centres in Serbia in which investigation of nanostructured materials has begun in early 1990's. Since then the research activities at DEMATEN are focused on processing and characterization of nanostructured materials - nanopowders, nanotubes, nanofilms and nanocomposites. The research team at DEMATEN consists of relatively young and qualified researchers, having considerable international experiences. Thus, the proposed RP-DEMATEN project will continue already initiated bilateral collaboration between researchers from FTUNS (DEMATEN) and five centres of excellence from Europe (Nanoparticle Process Technology, Duisburg (UDE); Institute of Macromolecular Chemistry AS CR, v.v.i., Prague, (IMCASCR); Institute of Materials Science, Athens (IMSNCSR); Institute of Materials Research, Kosice (IMRSAS) and Department of Ceramics and Polymers, Brno (DCPBUT)). The collaboration has been based on cooperative research activities, exchange of scientists, joint publications of the obtained results and the current European project - COST 539 "Electroceramics from Nanopowders Produced by Innovative Methods". Contrary to the previous type of collaboration, which was mainly based on the individual actions and contacts only between researchers from DEMATEN and other research groups (bilateral collaboration), the proposed project offers coordinated activities and multilateral collaboration among all participants. This will accelerate the setting up of sustainable partnership among the centres of excellence concerned and in the same time promote closer S&T cooperation between Europe and the Western Balkan Countries (WBC). In addition, successful cooperation will attract other centres from the Balkan region to join and participate in the future research activities, giving perspective of further integration of the Balkan region into the European Research Area (ERA) and therefore the European RTD activities and networks.

Currently, development of nanostructured materials and nanotechnologies is one of the priority research directions in Europe. Thus, emphasis in FP7 is continuously placed on new advanced materials and systems obtained using the potential of nanotechnologies, in particular higher performance nanostructured materials (e.g. nanocomposites) with improved electric and magnetic properties, including design and control of their processing, properties and performance (Theme 4 - Nanosciences, Nanotechnologies, Materials and new Production Technologies). Activities of the proposed project will be based on the synthesis, characterization and processing of nanostructured materials (nanocrystalline ceramics and polymer-based nanocomposites) as well as their integration into novel technologies. Thus, development of innovative methods for synthesis of different oxide nanopowders (controlled alkoxide hydrolysis (sol-gel), hydrothermal synthesis and chemical vapour synthesis) will be the base for training of young scientists during their stay in the centres of excellence. Different types of nanopowders will be synthesized, mainly based on Ti-, Zr-, Fe- and Mn-oxides, i.e. pure and doped simple oxides and complex oxides with perovskite, layered perovskite and spinel structures. Special attention will be also given to the synthesis of oxide nanopowders with controlled morphology, such as nanowires and nanotubes, due to their novel physical properties and potential

applications in the field of nanoscale electronics. Coordinated research activities, with main objective to reinforce research capacities and enable sustainable partnership among centres concerned, will also be used for the processing of functional nanostructured materials for electronic components and magnetic devices from the already synthesized nanopowders. Nanocomposites, consisting of the synthesized nanoparticles dispersed in polymer matrix, will be prepared using polymer technologies. Special attention, as one of the main subjects of the proposed study visits, will be focused on the chemical interaction of nanofillers with the polymer host as well as the composite processing with uniform dispersion of nanoparticles and nanotubes in polymer matrix. The relationship between processing parameters and nanopowder characteristics and their influence on structure and properties of the prepared materials and components will be analysed. The key objective, especially for young scientists is to learn how to tailor, at the nanoscale, novel material systems with new or improved properties and performance based upon better understanding of materials nanostructure. In addition, materials characterization and simulation techniques are also essential to better understand materials phenomena, in particular the structure–property relationship at different scales, to improve materials assessment and reliability. Since some newly developed characterization techniques are not well known or are unaffordable for researchers from centres belonging to the Western Balkan Countries (WBC) and the convergence regions of EU, an additional objective of the proposed research is also to compile them in use and support further development of nanomaterials in the convergence regions of EU and WBC. Thus, the subject of two training schools will be directly connected with the general problems in structural and functional characterization of nanostructured materials.

Realization of these activities requests (needs) the multidisciplinary team (including chemists, physicists, material scientists and engineers) and the international cooperation with research institutions in EU. Thus, the proposed project really provides the opportunity to develop strong partnerships among centres of excellence established in the EU's convergence region, the Member States and the WBC. This will be realized by: i) improving networking and exchanging of know-how and experience among the countries concerned through transnational two-way secondments of research staff among the selected centres, with inbuilt obligatory return mechanisms; ii) sending young scientists in the EU centres for specialised training or to carry out a specific research experiments; iii) reinforcing the human potential by hiring new young researchers at centres in the Western Balkan Countries (FTUNS), iv) enabling for the experienced researcher from abroad to return to the WBC and hire at FTUNS (DEMATEN); v) upgrading and renewal of S&T research equipment at FTUNS (DEMATEN) and vi) organising of conference, workshops and training schools to facilitate knowledge transfer at national and international level. Achievement of these goals should enable the research group of DEMATEN to become expert and competent in the challenging field of nanomaterials and nanotechnology, to reinforce the WBC research potential and to contribute to sustainable research development by reinforcing S&T potential. In addition, this will also help to centres of excellence in the convergence regions of EU (IMCASC, IMRSAS and DCPBUT) to become even stronger and more competent in this field.