1. General

The National Institute of (Research and Development in) Materials Physics (INCDFM) has as a strategic goal excellence in fundamental and targeted research in the area of condensed matter physics, including topics from solid state physics, chemistry and biology, with focusing on the area of multifunctional and nanostructured materials and nanosciences. With around 100 highly qualified specialists (Ph.D.), INCDFM plays a key role on national level and in the South-Eastern European region in the area of research on advanced materials and nanosciences, regarding: nanoscopic systems, thin and ultrathin films, surfaces, materials modified at nanoscale, new materials with compositional and structural modifications.

The general goal of this Project is the creation of an ***Euro-Regional Centre for Studies of Advanced Materials, Surfaces and Interfaces***, owing to the following: (i) the INCDFM expertise is largely acknowledged on international level; (ii) these areas are of highest actuality from the point of view of fundamental research (see the Nobel prizes for physics and chemistry from the last years); (iii) these areas have an enormous applicative, interdisciplinar potential - in most areas of physics and chemistry, and also in significative parts of biology, biotechnology, medicine, environmental sciences, geology, archeology, etc. This Euro-regional Centre aims to become an excellence pole with the highest expertise level in the area in the whole South-Eastern Europe. Similar research centres (excellence poles, focused on a top level subject in the thematic area of innovative materials and processes - though not exactly on "advanced materials, surfaces and interfaces") exist in Western Europe in Germany (Halle, Julich, Berlin), France (Saclay, Strasbourg, Montpellier), Sweden (Chalmers) or Spain (Madrid-Cantobianco).

Definitions:

a) by "studies" we will understand the following: synthesis, complex characterisations, experimental data interpretation and correlations, theoretical modelling (together with the corresponding feed-backs), and also large scale dissemination (ISI publications, international, euro-regional, and national conferences), patenting, large scale production, setup of "spin-offs". Hence, the word "studies" is not restricted exclusively to scientific studies, but integrates the management, dissemination, and application-oriented parts.

b) by "Euro-regional Centre" we understand a reference centre - we intend it to be the most performant - at the level of South-Eastern Europe and Balkans (Romania, Bulgaria, Hungary, Austria, Czech Republic, Slovakia, Poland, former Yugoslavia, Greece).

c) by "Advanced materials" we understand new materials, essential in the actual production processes in the areas of micro- and nanoelectronics, spintronics, piezotronics, sensors, detectors, materials working in extreme conditions (of pressure, temperature, radiation flux, cosmic space, corrosive environments), catalysts (homogenous and heterogenous catalysis, photocatalysis, magneto-catalysis), materials with remarkable mechanical properties (hard coatings, shape memory materials), microwave generators and waveguides, ultrahigh frequency materials, materials for medecine - controlled targeted medication, controlled delivery of medication, controlled apoptosis.

d) by "Surfaces and Interfaces" we accept the definition of the Surface Science review: "... including all interfaces between solid bodies, polymers, biomaterials, nanostructures, soft matter, liquids, gases and/or vacuum" and we complete it with "systems with a high surface/bulk ratio" (where surface and interface phenomena are predominant): nanoparticles, clusters, aggregates, nanostructured materials, metamaterials.

The specific aims of this project are the following:

1) *Improvement of the quality and competitiveness of research in INCDFM by modernisation and renewal of equipments* for preparation and characterization of nanostructures and functional advanced materials.

2) *Increase of the level of technological transfer of results* obtained in INCDFM towards industrial partners, strengthening of activities of realisation of prototypes, products, materials, diversifying of teh offer of services, testing, certifications, measurements.

3) *Integral valorisation of the human potential implied in reasearch in INCDFM*: hiring of young researchers, training of Ph.D. students and post-doctoral researchers, organization of lectures.

4) *INCDFM integration in the European Research Area* (ERA) by strengthening of existent collaboration relationships with European partners from public and private areas, etablishment of new relationships, common research projects, active participation in the Framework Programme 7.

In the following, we discuss the project's relevance and its framing in the aims of the competition.

(a) *Project's relevance with respect to the goals of Priority Axis 2 and of the intervention area.*

The project is relevant for the Priority Axis II. Increase of economical competitiveness by research and development and innovation - since it proposes the increase of the INCDFM R&D capacity and stimulation of innovation by development of cooperation with the productive sector. The project is framed in the Major Intervention Area 2. Investments in Reasearch and Development and Innovation Infrastructure, including by the fact that around 96 % of the sollicitated budget will be directly invested in the acquisition of new equipments with the most performant characteristics at international level and to the development of the existing ones at a level compatible with the EC level.

(b) Project's relevance to what proposes the addressed operation.

In spite of consistent investments during the last years - owing to funds attained by competition in the National R&D Plan, Excellence Programme, National "Capacities" Programme and European Programmes FP5 and FP6 - and in spite of its leading position at national and regional level, the INCDFM research infrastructure is not yet placed at an average level of the EC member states or does not cover new segments/activities, of high interest (surface physics, nanosciences and nanotechnologies, complex characterization of interfaces present in materials physics). From this point of view, it is urgently necessary the startup of an operation of the type O2.1. Development of the existing R&D infrastructure and creation of new R&D infrastructures, in order to recover in the shortest time of disparities with respect to the R&D infrastructure of the most modern existing European institutions with the same profile.

(c) Project's relevance for the scientific/technological area or for the targeted economical sector, on national and international levels.

The main goal of the Project is to maximize the excellence level of the research activities in INCDFM, necessary to complete its integration in ERA. This goal will be achieved by: (i) up-dating and modernization of the research infrastructure in correlation with the expertise capacity of the personnel; (ii) increase of the integration level of the research results in finite products with high added value; (iii) increase in competitiveness at international level (by establishing networks, collaborations, common projects); (iv) increase in the attractivity for young researchers (training activities, Ph.D. and post-doctoral programmes); (v) increase in the INCDFM visibility at international level; (vi) widening of the dissemination scale and intensifying of the knowledge transfer towards economy and society (publications, public communications, radio-TV broadcasting, internet, seminars for economical operators interested).

The proposed project will contribute to the elaboration of a more coherent tackling at regional and national levels in the area of nanostructures and functional materials. The use of the INCDFM resources in an integrated European framework will promote excellence, by achieving the critical mass necessary to the designed R&D areas.

The project shall contribute to the revival of the high tech industry in Romania, both in the area of the country's capital and in the principal regional centres (Cluj-Napoca, Iasi, Timisoara) by

delivering of new materials and technologies and by increase in the cooperation with European high tech Companies.

The INCDFM expertise in multi-disciplinary aspects of materials science will lead to:

- maintaining the leadership role of European research in the area of multifunctional nano-structured materials by multi-disciplinary investigations of their properties;
- setup of applications leading to the increase of competitiveness in national, regional and European industry;
- attraction of the industrial interests towards new perspectives in the area of multifunctional materials;
- intensifying the process of formation of new consortia for partnerships in ERA.

(d) Perceived priority and contraints identifications in the targeted area

The project proposes the development of a modern centre of surface and interface science, of compex laboratories for synthesis and characterisation of nanostructured materials, together with the necessary infrastructure for operation at high performance level. In our opinion, from the point of view of logistics, and also of rapid connexions with foreign countries, these facilities may be achieved with maximum efficiency near the country's capital, in the Magurele area. A major advantage of this area is the pre-existence of research infrastructure (actually in course of modernisation) and also that of the qualified manpower for exploitation and development of such facilities. Also, this project will contribute to the setup of a technological pole in the area of South Bucharest, formed by the research institutes of the Magurele platform and also by industrial partners and emergent spin-offs for services, expertise, technological development around the national and euro-regional facilities which will be developed in the area. We mention, also, the reduced air pollution level of the area (compulsary for the achievment of extremely clean areas, cleanrooms, epitaxy installations), the still accesible cost level of the land in the area and the existence of available areas for technological developments, micro-production, medium-scale production.

The proposed activities are targeted in the area of the necessary infrastructure in the framework of materials research, which is amongst the most diversified research areas with impact on short, average and long terms over several industrial branches. The main INCDFM advantages are connected to the access to different methods and to common development of procedures for a larger access of potential partners to successful projects with national, regional or European funding.

The development of new multifunctional materials will accelerate the realisation of structural changes and will contribute to the setup of new markets, products, services and jobs. The project will serve exchange of ideas and specific experience accumulated by several groups with the aim of promoting the technical and scientific progress on European level. The multi-disciplinary tackling will promote the transition from old technologies based mostly on empirical rules to new technologies based on a deeper knowledge of physical and chemical characteristics and of relevant phenomena. The principal priority of the knolwledge-ased industry is the Europe competitiveness in the future, contributing to the cohesion of European countries and to the economical rehabilitation of weakly developed regions.

Research and development in the nanomaterial areas is crucial for the achievment of a sustainable chemistry in Europe and in the promotion of health and security of citizens by reduction of residues and toxic emissions. The amelioration of the efficiency of these processes of decontamination and toxic emission prevention, due to new technologies, will lead simultaneously to the decrease of costs and to the increase of the eco-compatibility in specific areals.

An unbiased evaluation of the INCDFM potential in excellence promotion shows that the institute has highly qualified and known researchers, has largely cited publications (which show that the INCDFM research activities are important and recognised at international level), has long-term international collaborations and also multiple results with potential applications in economy, environment protection, medecine, etc. However, in spite of these excellence marks, the institute is not yet well known on the European technological level, and the participation rate to internationally funded projects is not as high as one might expect. The same thing holds also about the application of the reserach results in economy ad society. The lack of investment funds, typical for transition countries, was until now the principal cause for these facts.

Another identified contraint actually is connected to the inadmissible level attained by the bureaucracy connected to the research funding, which slows the processes of equipment acquisition, creates discontinuities in the microtechnological fluxes, re-direct a considerable amount from the specialists' efforts towards connex activities. We strongly hope that in POS-CCE this situation will be ameliorated.