

EMRS PRESIDENT, **PROFESSOR RODRIGO MARTINS** OUTLINES THE NEED FOR A PARADIGM SHIFT IN MATERIALS RESEARCH POLICY FOR EUROPE TO BECOME BOTH COMPETITIVE AND SELF-SUFFICIENT

Material matters

With more than 10,000 members from industry, government, academia and research laboratories, the European Materials Research Society (EMRS) – an adhering body of the International Union of Materials Research Societies (IUMRS) – encourages scientists, engineers and research managers to exchange information on an interdisciplinary platform, and recognises professional and technical excellence by promoting awards for achievement from student to senior scientist level.

Given the rapidly-expanding nature of the materials market and research environments – with the relatively recent discovery of new ‘wonder material’ graphene, for instance, and with new materials being used in everything from the aerospace industry to smartphones – promoting European materials science, at both the policy and laboratory level, is of fundamental importance, as European excellence in this field will not only bolster its place as a world scientific leader, but will also boost growth and economic recovery.

In an interview with Pan European Networks, EMRS President, Professor Rodrigo Martins, stresses the need for multidisciplinary research and for an intermediate step between academia and industry for both policy and paradigm to evolve and enable Europe to become both self-sufficient and competitive.

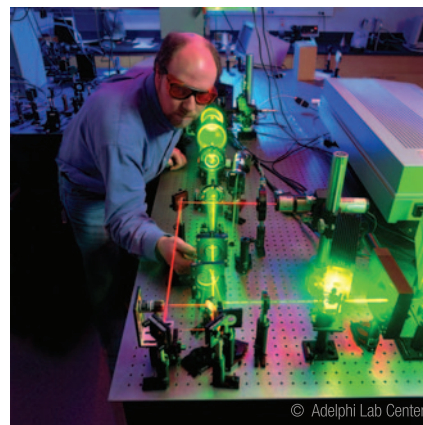
What role does the EMRS play in fostering innovation in materials science?

Materials science and engineering is a trans-disciplinary field and deals with the entire innovation and materials chains from novel or raw materials to advanced materials processing, from the original fundamental investigations of new materials to the industrial deployment of ‘smart’ production processes. Now is the time to expand European research efforts to cover the entire innovation cycle without jeopardising the traditional European strength in fundamental research.

Europe, however, is the poorest region in the world as far as natural resources are concerned, but we have a lot of knowledge. However, this knowledge is not being properly used to boost European development, and therefore, if you look at today’s situation in Europe, it is evident that we are fully dependent on the resources obtained from ‘BRIC’ countries. This, of course, means that we must innovate if we want our industry to be competitive, and we are thus striving to develop a new paradigm for Europe.

This new paradigm for European growth concerns the fact that we need new materials for a new Europe. It means that we have to begin to design our own materials – when we speak about the scarcity of materials,

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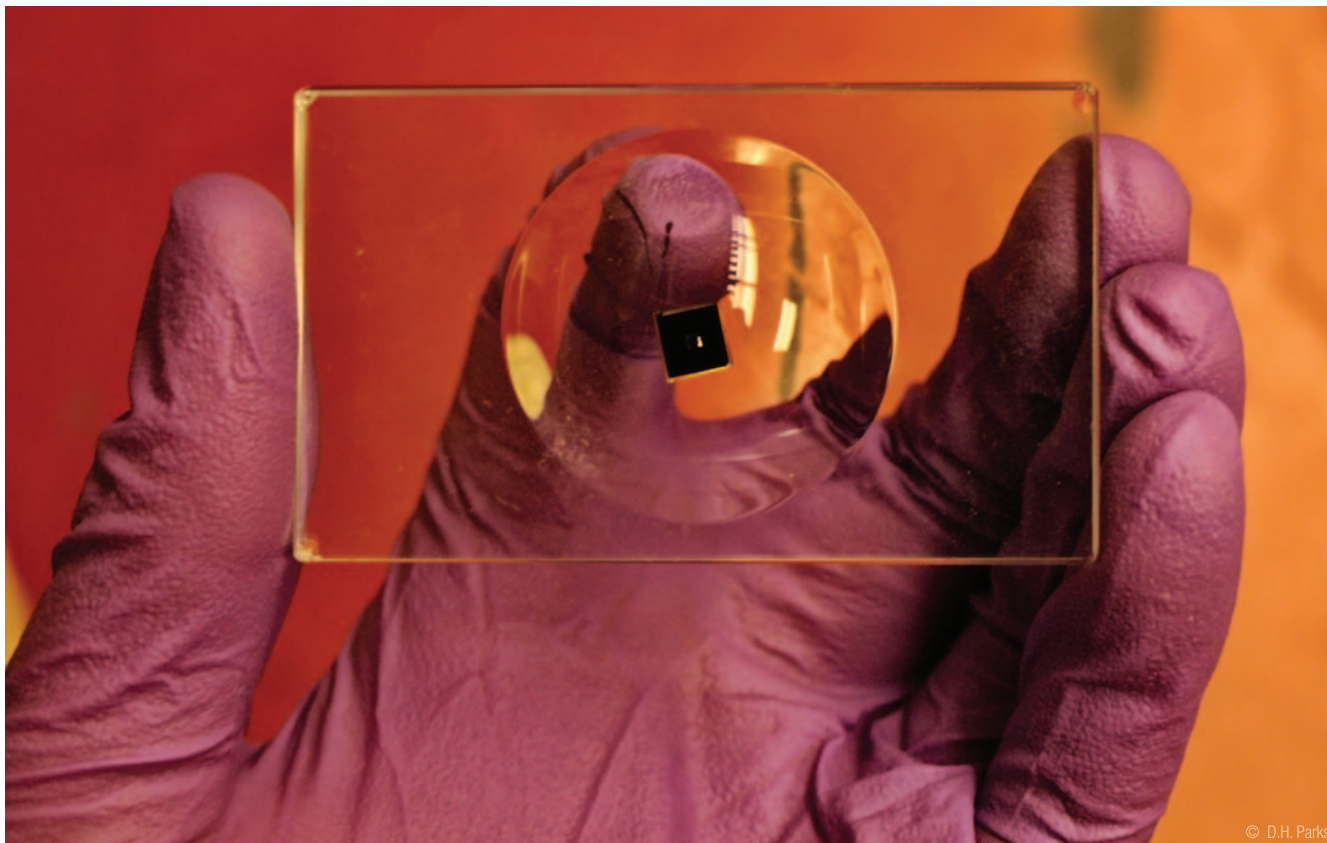
people just think of those materials that are classed as ‘rare’, which is not the case.

Since the industrial revolution, comfort and economic growth have been the two things that have come to matter most, but from this we have come to forget a very important point: we should work with, rather than against, nature.

As such, there will be three new paradigms in the future because we need to optimise the resources that we have, we have to create the resources that we need, based on our knowledge, and thirdly, we need to recycle, but recycle according to the environment.

Some European projects are looking to link nature with nanomaterials, while others stress the importance of interdisciplinary research. In your opinion, what are the most important features in nano composite materials research?

In this sense, research from a multidisciplinary point of view is fundamental: we need to have people looking at the same thing but from different angles; we need to have people coming from the areas of physics and engineering, mathematicians and even people from the social science and humanities sector. It is this cross-disciplinary approach that will enable us to create the new things.



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However, sometimes the terms ‘innovation’ and ‘invention’ are misunderstood, and this is something that should be clarified.

Invention means to try to create something that is new and original. Most of the time the market is simply not ready for these products and, more often than not, the end-users are not ready to use them.

Innovation, on the other hand, concerns designing a product that the end-users actually desire, which, of course, means that the market is ready. It is important that the two terms are understood as being totally distinct concepts, and this is something that, here at the EMRS, we are constantly trying to make sure is understood, both at a national policy level and within the European Commission, because we need innovation over invention in order to generate research that is practical and timely.

In Europe, we must focus on this as a way to create jobs and to promote European industry, and we are therefore proposing to the Commission that we must have something intermediate between big industry and academia. This is important because there is a distinct sense that big industry does not care too much about innovation, as they have their own

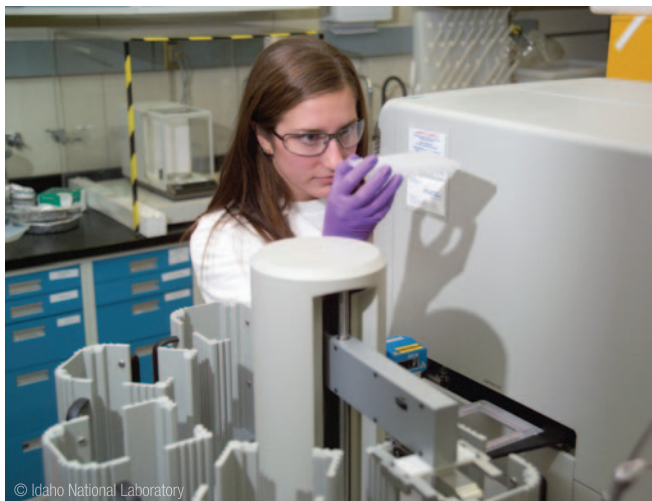
In Europe, we must devise a knowledge-based strategy which will enable us to promote and create new and innovative concepts

researchers and projects, and, indeed, they almost always plan with a five- or ten-year strategy, which means that, while things may feel new to the end-user, the product is old news to the industry, who have already moved on.

As such, at the European level, it is necessary to promote two things: the first is to follow-up the best projects. An excellent project should not be concluded just because it is at the end of its funding schedule; a follow-up study should be conducted which could be designed to investigate the possibility of industrialising the products that were developed during the project. This means that we must have pre-commercial prototypes at the end of the project – pilot lines – which can be used to see if the product is actually needed and if the end-users will accept it. Pilot lines mean that there is now an intermediate stage, thereby providing a flexible body which can provide all the tools to test if this invention or innovation will be accepted by the market.

The second point that should be promoted concerns the fact that there is a crisis in Europe; a crisis of growth, because, quite simply, there is no growth. This is because European industry is not strong enough to be competitive with countries that do not seem to care about societal issues.

What is more, sustainability is hugely important, as is the need to have Europe at the forefront of innovation and its industry to be associated with excellence in areas related to enabling technologies as a way to facilitate the potential for innovation that exists at a European level. This is something that the creation of PPPs (public private partnerships) can solve, and this is now underway. Indeed, during Denmark’s European presidency an agreement was reached which involves both academics and industry societies representatives (EMRS, FEMS, EMF and EuMat) and from those industry, the idea being that this will boost this type of



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and long-term vision, and enable job creation and foster growth.

How do you think Europe can be made a more attractive place for that sort of innovation to take place?

I believe that in Europe we must devise a knowledge-based strategy which will enable us to promote and create new and innovative concepts. This can also have beneficial knock-on effects. For instance, if Europe is able to create new and innovative ideas for the green economy, it will be able to become almost independent from many geo-political problems, and, perhaps a point that is just as important, will be energy independent as it will be using its own, readily available natural resources such as solar, wind and tide.

How do you see this progressing from a policy point of view?

The European Parliament and Commission have a lot of power in this field, but they are not used to wielding it. Typically, politicians like to please the people who vote for them, but the problem is that science has no particular political allegiance, and is therefore never catered for by one particular policy-maker or party. It is therefore important to work closely with them, and it falls to the role of the relevant scientific societies to discuss ideas and concepts and to show MPs how science is relevant and how important it is to pass that message to both the media and the general public.

A final crucial point is that people often need to feel that the money that they are contributing is being put to the correct use and is fostering growth. This is vital, and more and more of the scientific societies such as the EMRS are working in close association with other types of societies and associations, such as FEMS, EMF and EuMat in order to pass the message on to politicians.

**Full Professor Rodrigo Martins
President
European Materials Research
Society (EMRS)
Universidade Nova de Lisboa
Portugal**

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initiative at the European level. Three such PPPs have already launched, and a fourth is in the pipeline.

It appears, then, that this is working.

Yes, I believe so. EMRS is trying to be at the forefront of this, discussing and promoting ideas. For instance, EMRS is promoting energy research, and we now need more people to realise the potential that nature holds. Indeed, some may simply see water as water, while we see it as potential energy. With energy comes progress.

However, CO₂ is a huge problem when it comes to any type of energy research or generation, and this problem will not be solved by simply imposing emission limits. I believe we should look at CO₂ as a raw material, and should develop ways in which it can be re-used as an energy source. We have proposed this idea to the European Parliament, and it was accepted by the European Commission, which has launched a study that has already generated positive results. The Commission has now launched its first call projects.

You have mentioned the intermediate step between academia and industry, what are your thoughts on Horizon 2020 as a possible catalyst to get things moving from the laboratory and into the marketplace?

This is a major focus in Horizon 2020, and should also act as a catalyst for innovation. This focus will also mean that academia is not almost solely relied upon for invention, but that they will also be looked to for innovation.

Nevertheless, this innovation, and any invention, must be used to generate capital. This is vital, and if it is failing, then it could very well be signalling the end of Europe as a strong industrial entity.

Moreover, we must also realise that while there are big investors in Europe across the 27 member states, most of the jobs in Europe are created by SMEs because they are very flexible. They can appear and disappear quickly and, indeed, they can be used as testers, which means that those who are making innovative new products do not have to look towards big industry to test them.

Again, this is where the idea of pilot lines comes in to play, as this idea will enable SMEs to make the largest amount of money in the shortest possible time, which, clearly, will feed in to both a medium-