



MINISTRY OF EDUCATION AND RELIGIOUS AFFAIRS
GENERAL SECRETARIAT FOR RESEARCH AND TECHNOLOGY
SUPERVISION OF RESEARCH CENTERS DIRECTORATE

Evaluation Report

Domain:Engineering Science

Date: 23-29/1/2014

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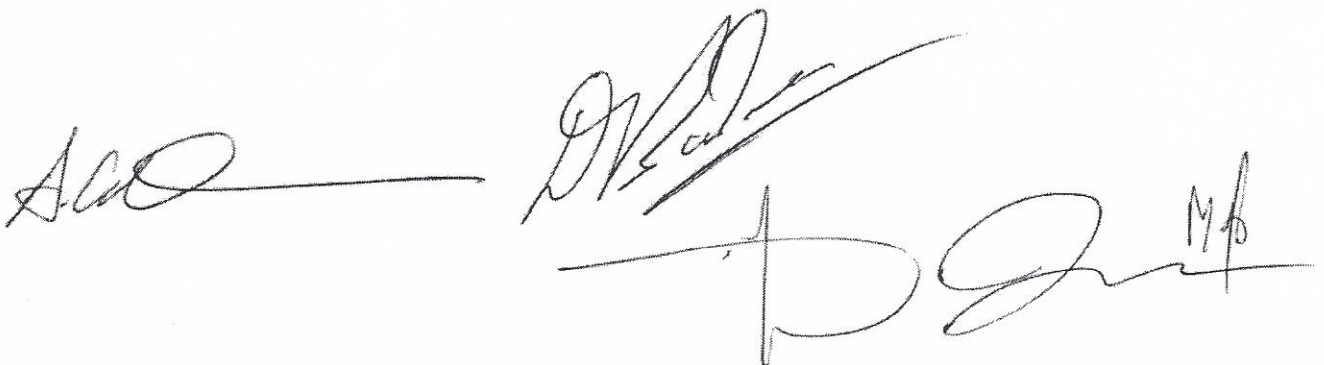
Institutes

- CHEMICAL PROCESS AND ENERGY RESOURCES INSTITUTE (CENTER FOR RESEARCH AND TECHNOLOGY HELLAS)
- HELLENIC INSTITUTE OF TRANSPORT (CENTER FOR RESEARCH AND TECHNOLOGY HELLAS)
- INSTITUTE OF CHEMICAL ENGINEERING SCIENCES (FOUNDATION FOR RESEARCH AND TECHNOLOGY)

The image shows three handwritten signatures in black ink. The first signature on the left is a cursive name that appears to be 'S. V. ...'. The second signature in the middle is more stylized and difficult to decipher, possibly 'G. ...'. The third signature on the right is also cursive and appears to be 'M. P. ...'. There are horizontal lines drawn under each signature.

EVALUATION COMMITTEE

1. Dr. Alfred Weber, Professor *Rer. nat.*, TU Clausthal, Institut für Mechanische Verfahrenstechnik, Leibnizstraße 19, 38678 Clausthal-Zellerfeld, GERMANY
2. Dr. John F. Munro, Adjunct Assistant Professor, Graduate School of Management & Technology, University of Maryland, Baltimore, USA
3. Dr. Dan Bader, Professor of Bioengineering and Tissue Health, Faculty of Health Sciences, University of Southampton, Southampton, UK
4. Dr. Jean-François Gerard, Professor, Directeur de la Recherche INSA Lyon / Vice- President for Research, INSA de Lyon, Ingénierie des Matériaux Polymères, LYON, FRANCE
5. Dr. Maria Douka, Policy Officer, European Commission, DG Research & Innovation, Bruxelles, BELGIUM



Handwritten signatures of the Evaluation Committee members, including a signature on the left and a larger signature on the right with the initials 'MB' at the end.

EXECUTIVE SUMMARY
of the Evaluation Committee (23-29/01/2014)

Institute of Chemical Engineering and High Temperature Processes (ICE/HT)

1.0 Introduction

During the period from 2005 to 2013 there has been a considerable change in the economic and political climate at the national level. This has clearly affected the willingness to invest in R&D and the capacity of the public and private sector to engage more fully with the Institute. Clearly, this was not envisaged in the assessment of 2005 and in the strategic planning of the Institute. This climate is very different from 2005. Nonetheless the Institute has adapted admirably to this unforeseen environment. The Committee fully appreciates how challenging this has proved. This clearly affected the moral of the whole country. This reflects the current status in which short term strategies dominate and the inability to forecast financial stability and sustainability (in research, innovation, etc..) hampers the ability of CPERI (and other Institutes) to optimize and to specialize their research priorities. Finally, the application of Value Added Taxes (VAT) to quasi-public research institutes such as ICE/HT works against the development and implementation of a robust chemical engineering research portfolio that is congruent with Europe and the rest of the developed world.

1.1.- General description of the field

The Institute has made significant progress since the last evaluation in all areas examined by the 2005 Committee such as, research excellence, attracting competitive research grants, with increasing evidence of both short and longer-term benefits to society. The committee has no doubt in rating the Institute today a world class Centre of Excellence judged by a range of standards. Its current standing is the result of efficient leadership and performance of its research staff which have led to high visibility and tangible outcomes.

1.2.- State of the art in Greece compared to Europe and the rest of the World

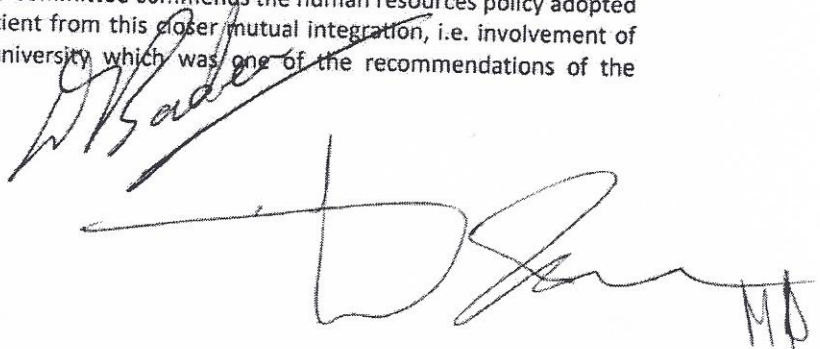
The ICE-HT Institute under the umbrella of FORTH has a recognized activity in fundamental research dedicated to advanced materials (with a special emphasis on interfaces) applied to energy and environment-related issues. The Institute has a long and distinguished history. It has clearly benefitted from its relationship within the FORTH umbrella of Research Institutes. Indeed the Committee notes how well its philosophy and research strategy of excellence in science matches that of its overall organization, namely,

- targeting scientific research in selected strategic areas of high added value
- developing potential human skill from close links with Universities
- contributing to the economic development from a knowledge transfer to companies.

According to these missions, the Institute succeeded as it develops at the forefront scientific research established as world-class level in nanotechnologies and advanced materials dedicated to sustainable development.

1.2.1.- Human Capital

In the assessment period, the Institute was able to both attract first-rate scientists and lose some from its world-network established for both European and USA collaborations, as well as from its proximity with the Patras University. The Committee commends the human resources policy adopted in the assessment period was very efficient from this closer mutual integration, i.e. involvement of collaborating faculty members, with university which was one of the recommendations of the



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previous assessment. The research staff joins scientists with the appropriate and experience to have a dynamic scientific management of the Institute for the next period.

1.2.2.- Research accomplishments

According to the research action plan presented at the beginning of the assessment period, important accomplishments arose from the Institute activities. This impressive performance applies to both basic research and technological realizations. Thus, the following topics could be highlighted according to the partitioning of the research and development activities as they were presented to the Committee:

. Nanotechnology – Advanced Materials

- Development of high efficient filtration membranes for wastewater management and the understanding of nano-sorption and nano-mobility in single wall carbon nanotubes
- Innovative nanowires and nonlinear optical glasses for energy conversion and photonics
- Heterogeneous catalysts for chemical processes and gas emission reduction.
- Laser synthesis of new materials for optics and nanofabrication of low-dimensional structures

The research has provided important answers to the critical relationships between the molecular structure and/or nanostructures and the physical and chemical properties of the advanced materials under investigation. The Institute developed a complete chain of knowledge from the molecular scale to the integration in operative devices which brings a high relevancy to the conducted research.

. Energy

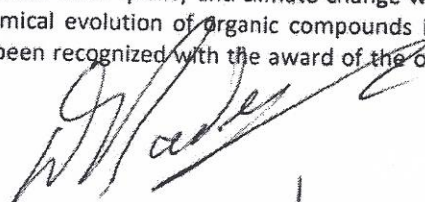

- Novel catalytic systems for the production of hydrogen via steam reforming of methanol and preferential CO oxidization as potential competitors for fuel cell processors including photo-electro-catalysts for solar energy harvesting and conversion.
- Development of robust membranes operating at high temperature for Internal reforming Methanol Fuel Cells (IRMFC)

. Environment

- Development of DBD plasma reactors for soil remediation
- Filtration of agro-industrial wastewaters and extraction of high added value organic compounds. Such a concept was demonstrated for olive mill wastewater, which clearly addresses a need of the local community.

The committee also want to highlight the following scientific achievements:

- Graphene and graphene-based nanomaterials. The Committee also recognizes new important developments in the areas of nanotechnology (e.g. Graphene and Carbon Nanotubes) and environmental science and technology (e.g. air pollution). Their competitive excellence has been recognized with the award of an ERC Advanced Grants to the institute, numerous FP7 programmes and its inclusion in the prestigious Graphene FET Flagship.
- High temperature polymer electrolyte membranes from the synthesis of innovative stable aromatic polyethers which has resulted in the launch of a spin-off, Advent Technologies. In addition, the research on HT polymer electrolyte membranes and electrocatalysts facilitate the design of membrane-electrode assemblies at the lab-scale as relevant demonstrators of new fuel cells.
- Air pollution engineering and contribution to air quality and climate change with development of new approaches to describe the chemical evolution of organic compounds in the atmosphere. This competitive excellence has also been recognized with the award of the other ERC Advanced fellowship to the institute

1.3.- Overall Assessment of ICE/HT

The ICE-HT Institute could be considered as one of the leading nodes of the European network of research centers operating at the best scientific level in these areas. Although the Institute operates in the realm of basic sciences, there is clear two-way traffic of knowledge. Thus its scientific outputs offer solutions for technological developments and the identification of practical issues offers to the involved scientists a number of key fundamental scientific questions. This latter situation will lead to innovative research within the Institute as supported by the excellent expertise in specific areas. The quality of the research achieved is clearly a product of the well-designed laboratories and state-of-the-art equipment and the carefully controlled test protocols developed in the Institute.

In the assessment period (2005-13), the Institute has strongly improved its scientific position and academic reputation in chemical and material engineering, as well as in environmental engineering. According to the high quality nature of its scientific output including translation to patents, the Institute could compete equally with well-known and well-established research centres within Europe, for example the Max-Planck and CNRS Institutes. Its membership to FORTH with whom the Institute shares its values and missions, guarantees the long-term quality of the conducted research.

1.4.- Opportunities and Threats in Relation to the National and Regional Economy

The Committee believes that the evolved relationship with the University of Patras represents a critical element to the success of the Institute. Indeed recent developments have embraced new associations with the Department of Biology at the University. However, it was noted that a high proportion of permanent researchers had their training (at post graduate and postdoctoral level) at the University of Patras in the period in which the Institute was established. This may have important consequences if the existing situation of lack of recruitment continues as it is envisaged that many of these will be of retirement age within 15 years.

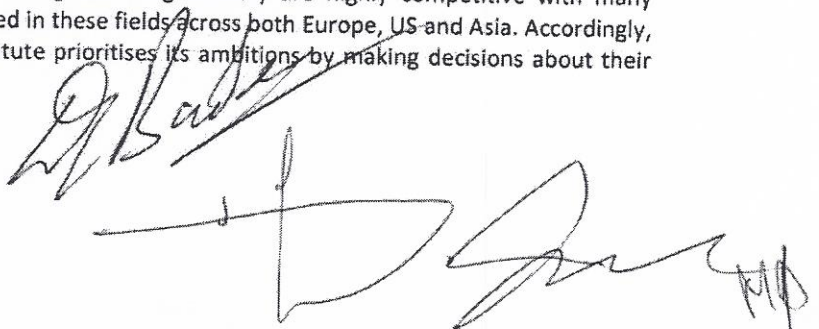
Concerning recommendations provided by the evaluation Committee on July 2005, the Institute has generally addressed previous recommendations in a convincing manner namely to

i/ Focus on material and device-oriented activities - There has been major successes in the quality of research output with clear evidence of high IF journals (e.g. Nature Communications, Advanced Functional Materials), while maintaining an increase in the number of journal publications each year. An achievement that the Institute should be rightly proud of. In connection with these achievements, there has been a significant increase in the competitive funding (FP7 grants, ERC etc). In addition, the spinoff company (Nanothinx SA) arose from material-related activities within the Institute. The other spinoff company (ADVENT Technologies) resulting from advances in the area of novel polymer synthesis and new fuel cell technologies developed in-house has recently expanded its activities in the US.

ii/ Incentives for the promotion and development of researchers. A certain proportion of the researchers have been promoted to higher ranks as a result of their improved performance.

iii/ Development of integrated "lab-on-a-chip" microfluidic systems for nucleic acid and protein analysis. This has been partly enveloped into the Biosciences and Biotechnology theme. In this highly competitive research area, progress has been relatively modest.

The Committee values the energy and enthusiasm in which the Institute has embraced the relatively new theme of Biosciences and Biotechnology. Indeed we were delighted to note a by-product of this initiative has been the introduction of a cohort of biologically-educated students into the Institute, which will clearly expand its multidisciplinary nature. However, the proposed research topics including metabolomics, tissue engineering and drug delivery are highly competitive with many active and well-established labs engaged in these fields across both Europe, US and Asia. Accordingly, we strongly recommend that the Institute prioritises its ambitions by making decisions about their





strengths/expertise and focusing into "Niche" areas within the general themes for which they can aspire to become world-leading. As an example, they might consider utilising the undoubted excellence in advanced materials and nanotechnologies to develop a novel scaffold platform for tissue engineering and drug delivery.

The Committee members welcome the appointment of Dr Burganos as the new Director of the Institute. His revised future plans offers considerable scope for continuing their academic excellence in established themes, while focusing in new themes which match with the research landscape in which EU and other funding agencies will be directed. He will need to demonstrate leadership in research and management at a similar level to his predecessor. On a personal level he will need to up-regulate his academic visibility and prominence to maintain the Institute's venerable status in the international community.

1.5.- Recommendations and Measures to Be Taken

1. Strengthen the research areas in which excellence is clearly demonstrated such as nanotechnology/ materials, environmental science and energy. Focus in emerging themes associated with Biosciences and Biotechnology in order to establish an aspiration target of international competitiveness.
2. New recruitment of permanent research staff is urgently needed; the new recruits should strengthen the research topics with proven record of excellence, such as the Graphene work, air pollution and fuel cell technologies.
3. The policy towards innovation should be continued and reinforced with the creation of appropriate structure inside the Institute, and allocation of specific resources for that. This will facilitate the establishment of new spinout companies, backed by the establishment of new patents and an increase in the service provision for appropriate industrial sectors.
4. The current level of state funding to an Institute that demonstrates excellence in research and innovation is unacceptable and must be urgently increased at the first instance. This will assist the Institute to encourage retainment of its research staff and attract external researchers (both young and more senior), both of which are critical for its future development.
5. The successful model of cooperation and exchanges with American universities and scientists should be extended and encouraged with Europeans; this scheme should go beyond the EC funded projects and/or initiatives.
6. The Institute should welcome the participation of INTERNATIONAL experts in the Scientific Advisory Group (or create an International Steering Committee)



MB

**INSTITUTE OF CHEMICAL
ENGINEERING SCIENCES
(FOUNDATION FOR RESEARCH AND
TECHNOLOGY)**



AND 


TABLE 1

How do you evaluate the Institute with respect to 5 4 3 2 1

	5	4	3	2	1
1. Leadership	5				
2. Mission and goals	5				
3. Strategy and policy	5				
4. Adequacy of the resources	5				
5. Funding policies		4.6			
6. Facilities		4.8			
7. Academic reputation		4.9			
8. Societal relevance		4.8			
9. Balance of the strengths and weaknesses		4.9			
OVERALL ASSESSMENT	4.9				

REMARKS

1. Efficient leadership which has resulted in high visibility and tangible outcome. The excellence of science was promoted and enhanced
2. Mission and goals were successfully accomplished
3. Strategy and policy is consistent with the mission and goals defined by FORTH. The Committee noted that with the change of Director, there will inevitably be a change of emphasis on new areas. This should not diminish the impact on science excellence achieved to date.
4. They are doing excellently with the available resources.
5. Efficient and balanced funding policy. We are delighted to note that they have received two Advanced ERC Fellowship awards during the period.
6. They have good and well-focused facilities. The Committee appreciated the tailor-made facilities, which are regularly updated, and match the initial goals and specific needs of individual researchers.
7. The Institute provide good ambassadors to maintain and enhance their international reputation.
8. They address areas with direct societal relevance (eg. waste treatment management). Some of these areas necessarily provide the underpinning basic sciences with only long term potential. The Committee noted that the Institute target research in local issues using sophisticated techniques eg. the removal and recovery of phenols from olive mill wastewater.
9. The strengths far outweigh a few particular weaknesses

TABLE 1 ICES

Handwritten signatures of committee members, including a large signature in the center and several smaller ones to the left and right.

TABLE 2

How do you evaluate **quality** of the Institute with respect to 5 4 3 2 1

1. Originality of the approach and ideas		4.9			
2. Significance of the contribution to the field		4.7			
3. Coherence of the Institute ¹		4.8			
4. Prominence of the Institute head	5				
5. Prominence of the other research staff		4.8			
6. Quality of scientific publications (scientific impact)	5				
7. Quality of other results	5				
OVERALL ASSESSMENT OF QUALITY	4.9				

REMARKS

1. They had successfully extracted basic science- related questions in order to design, synthesize and characterize materials and mechanisms. They are aware of the available technologies and appreciate the need to extend the basic science to resolve technological problems.
2. In some well-defined areas such as energy, advanced materials, environment, nanomaterials and technology they contributed excellently to the knowledge-base.
3. Coherence was clearly demonstrated in the presentations. The Committee noted that certain areas were applicable in different themes which were highly appreciated.
4. The prominence of the Institute director for the evaluating period (2005-2012) is excellent. The Committee welcome the appointment of the new director, however he will need to demonstrate similar leadership in research and management.
5. The Institute benefits from strong and historical collaborations with the University of Patras (senior staff as well as postgraduate students). Accordingly there is high prominence in many of the researchers associated with the Institute. It has also secure an excellent position with real collaborative links with prestigious organizations in Europe and USA.
6. They produce excellent papers with an increase, both in number of papers and the impact factor, to an impressive mean level (3.50 in 2012) despite the economic crisis. This increase reflects the strategy of the former director.
7. The Institute has produced a portfolio of research output which include patents, spin-off, distinctions, FET – Flagship-Graphene, which confirms their openness to demonstration activities and dissemination.

¹ with respect to individual laboratories

TABLE 2 ICES

TABLE 3

Considering the number of staff, how do you evaluate the productivity of the Institute with respect to

5 4 3 2 1

	5	4	3	2	1
1. Number of Ph.D theses		4.8			
2. Number of scientific publications		4.8			
3. Number of professional publications		4.5			
4. Other results		4.8			
5. Distribution of published output within the Institute		4.7			
OVERALL ASSESSMENT OF PRODUCTIVITY	4.7				

REMARKS

1. The quality of the research performed and the links with the university has resulted in an impressive collection of PhDs, 97 in the 2005-2012 period which would be the envy of many academic departments. They had also developed the appropriate strategies to attract Marie Sklodowska - Curie actions.

2. There are an increased number of publications which have not been produced at the expense of quality.

3. The professional publications do not match with that the scope of Institute goals. If the Committee consider patents as "professional publications", it has scored this category positively.

4. The committee assessed this category in terms of visibility at international conferences, collaborations with prestigious institutions, world-wide networks (EU/USA). Accordingly their vertical and horizontal integration is well developed and mature.

5. It is difficult for the Committee to judge, but if their consider that as a result of integration between teams and interactions with Universities, there is an excellent distribution in research output.

TABLE 3 ICES

Handwritten signatures of committee members, including a large signature in the center and several smaller ones below it.

TABLE 4

Considering the objectives of the Institute, how do you evaluate the relevance of its research activities with respect to

5 4 3 2 1

1. The advancement of knowledge	5				
2. The dissemination of knowledge		4.9			
3. The implementation of knowledge		4.7			
OVERALL ASSESSMENT OF RESEARCH RELEVANCE	4.9				

REMARKS

There is a clear advancement of knowledge as reflected in the excellent output in high impact scholarly journals, patents and general commercialization through to spin-off companies.

TABLE 4 ICES

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TABLE 5

Considering the present status and future developments of staff and facilities, how do you evaluate the long-term vitality of the Institute with respect to

5 4 3 2 1

1. Its past scientific performance		4.9			
2. Its future plans and ideas		4.5			
3. The staff age and mobility		4.6			
OVERALL ASSESSMENT OF VITALITY	4.7				

REMARKS

The Committee believes that past scientific performance should not be assessed in the category with long-term vitality of the Institute.

1. The Institute has a strong history of excellent performance.
2. They have incorporated some new themes which are challenging and highly competitive with risk as well as high reward if they succeed. This is exemplified by the Bioscience and Biotechnology Research themes. Nevertheless focus is critical as expanded further in the Executive Summary.
3. The financial crisis clearly threatens the vitality over the long term. The Committee believes that the vitality can be enhanced without the need of continuous support from researchers from their venerable history. The established networks offer extensive opportunities of mobility for the staff (eg. Marie Sklodowska - Curie scheme)

TABLE 5 ICES

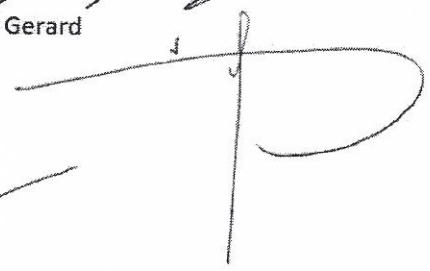
Handwritten signatures of committee members, including names like 'Sue', 'G. Bae', and 'M.B.'.

THE EVALUATION COMMITTEE

1. Professor Alfred Weber 

2. Adjunct Assistant Professor John F. Munro 

3. Professor Dan Bader 

4., Professor Jean-François Gerard 

5. Dr. Maria Douka 