

# **Evaluation of the Research and Professional Activity of the Institutes of the Czech Academy of Sciences (CAS) for the period 2010–2014**

## **Final Report on the Evaluation of the Institute**

**Name of the Institute:**

**Institute of Rock Structure and Mechanics of the CAS, v. v. i.**

**Fields, in which the Institute registered its teams:**

Materials engineering, materials science and nanotechnology

Observer representing the Academy Council of the CAS: Jiří Chýla

Observer representing the Institute: Filip Hartvich, substitute observer Lubomír Němec

### **Commission No. 8: Engineering and technology**

Chair: em Prof.DI.Dr.Dr.hc. Hans Peter Nachtnebel

Date of the visit of the Institute: Wednesday October 14, 2015, from 09:00 till 13:00.

Programme of the visit of the Institute: see Minutes from the visit

Evaluated research teams:

*No. 1 - Laboratory of Structure, Properties and Processing of Materials;*

*No. 2 - Laboratory of Inorganic Materials;*

*No. 3 - Department of Composites and Carbon Materials*

## **A. Evaluation of the Institute as a whole**

# **INSTITUTE OF ROCK STRUCTURE AND MECHANICS**

## **1. INTRODUCTION**

### **1.1 Structure and location of the institute**

The institute of Rock Structure and Mechanics consists of 5 departments:

- Department of Seismotectonics
- Department of Geochemistry
- Department of Engineering Geology
- Department of Materials Structure and Properties
- Department of Composites and Carbon Materials.

All departments are located in Prague. There are two joint research laboratories. The laboratory of Sorption and Porosimetric Analysis is part of the department of Geochemistry and is operated jointly with the Faculty of Science of Charles University in Prague. The laboratory of Inorganic Materials is part of the department of Materials Structure and Properties and is operated jointly with the Faculty of Chemical Technology of the University of Chemistry and Technology in Prague. Further, the institute of Rock Structure and Mechanics operates the World Centre of Excellence for Landslide Risk Reduction, jointly with the Faculty of Science of Charles University in Prague.

### **1.2 Brief history of the institute**

The origin of the institute goes back to the Mining Institute of the Czechoslovak Academy of Sciences, founded in 1958. The activities of the institute gradually evolved. It obtained its current name in 1992 with the founding of the Academy of Sciences of the Czech Republic.

### **1.3 Mission and research topics**

The research topics of the institute encompass structure and properties of rocks and rock medium, derived inorganic and organic materials, and special composite materials. The studies on rock medium cover natural and induced processes affecting behaviour, development and stability of rocks in their natural location in the earth crust. The research topics related to the earth and the connected environmental- and geosciences fall in the category of Natural Sciences. Some research activities on materials fall in the category of Engineering and Technology. There are also activities on materials in the category of Medical and Health Sciences.

### **1.4 Staff size and full time equivalents age distribution**

The number of staff is 106 at the end of 2014. 67 persons are researchers spread over the departments. There is no precise information on the corresponding FTE, but this is very likely around 50. About half of the staff is younger than 45 years.

## **2. STRENGTHS AND OPPORTUNITIES**

### **2.1 Topicality of research subjects**

The research subjects are all well-chosen.

## **2.2 Budget: Ratio of institutional budget, grants and contractual resources, international funds**

About 50 % of the income of the institute comes from direct funding by the Academy of Sciences, without any aspect of competition. The other 50 % comes from project grants of different sources, earned in a competitive way: Academy of Sciences, Czech Science Foundation, diverse ministries and others and comes from contract research. About 30 % of the income is earned outside the Academy of Sciences. The institute has no EU-projects in strict sense. The institute receives funding of Czech origin as national part in a European Infrastructure project. The institute would prefer a larger part of the funding provided directly by the Academy of Sciences, without competition. The evaluation commission understands that it would be much more comfortable for the institute to have a larger amount of non-competitive funding. However, in contrast to the opinion of the institute, the evaluation commission judges that the income sources of the institute are well balanced and is comparable to the repartition of a typical research group in mechanical, civil or chemical engineering at a university in western European countries

## **2.3 Intensity of collaboration among teams and among institutes, national collaboration and international involvement**

The different departments work mainly in their own areas with only limited interactions between the departments of the institute. The evaluation commission does not judge this as a shortcoming, since the topics covered by the different departments are quite distinct. There are collaborations with other institutes of the Academy of Sciences and with several Czech universities. There are also collaborations with foreign universities and research institutes, but not in the sense that these collaborations benefit from EU or international research grants.

## **2.4 Position of the institute within the Czech scientific community and its international position**

The institute is very relevant in the national context and international context.

## **2.5 The overall capacity of staff**

The overall capacity of the staff is good. There are no particular weaknesses.

## **2.6 Reasonability of the structure of the institute and the departments**

The evaluation commission judges that the structure of the institute is appropriate.

## **2.7 The age structure**

The age distribution of the staff is very advantageous, with about half of the staff younger than 45 years, with young scientists well represented in all research teams. The presence of older staff members, in the categories 65-70 years and above 70 years is not reported as a drawback by the institute. There is no precise information on gender repartition. It is stated that it is good for the institute as a whole, but that there are large differences among the different research teams.

## **2.8 Frequency and quality of publications**

The number of publications in the evaluation period of 5 years is about 237. The number of publications per year and per FTE researcher is about 1. About 15 % of the publications are in first-decile and first-quartile journals and about 25 % is in second-quartile journals. The number of citations is about 220, of which about 11 % are in first-decile and first-quartile journals. The institute publishes a peer-reviewed journal and publishes another one in co-operation with the University of Chemistry and Technology in Prague.

## **2.9 Patents and role in contractual work**

There is no precise information for the institute as a whole on patents. But there are patents and there is considerable contract research.

### **3. WEAKNESSES AND THREATS**

#### **3.1 Topicality of research subjects**

The research subjects are very relevant.

#### **3.2 Budget: Ratio of institutional budget, grants and contractual resources, international funds**

The evaluation commission judges that the distribution of the income of the institute among the three main sources (direct funding by the Academy of Sciences, industrial contract work, grants obtained from agencies in a competitive way) is well balanced. A threat, to which most research teams in western and middle Europe are confronted with, including the Institute of Rock Structure and Mechanics, is the tendency for reduction of the funding possibilities on the national level and thus the necessity to be successful in projects with EU funding or international funding. The institute does not aim yet at acquiring substantial EU and international funding. This is clearly a weakness.

#### **3.3 Intensity of collaboration among teams and among institutes, national collaboration and international involvement**

The institute has intense collaborations with other institutes of the Academy of Sciences, Czech universities and research teams. These collaborations benefit from common research grants. The institute has also a considerable amount of collaborations with foreign research institutes and university teams, but many of these are not structured in the sense that the collaborating partners do not obtain funding from international origin. Of course, this observation is not relevant for the international collaborations of the institute with funding of each partner by own national means, as a consequence of international agreements. But the institute has bilateral collaborations without explicit funding. It looks appropriate that research teams of the institute define well-chosen foreign partners for long-time co-operation, in particular within the EU. This applies, in particular to the research teams on materials. This can be beneficial on the pure scientific level and certainly opens the possibility for participation in EU-funded projects or internationally funded projects.

#### **3.4 Position of the institute within the Czech scientific community and its international position**

The Natural Science sections of the institute are highly regarded on the national and international level. The international visibility and recognition is less, but quite good, for the Engineering and Technology sections of the institute.

#### **3.5 The overall capacity of staff**

The overall capacity of the staff is good.

#### **3.6 Reasonability of the structure of the institute and the departments**

The structure of the institute is good.

#### **3.7 Comments on the age structure**

The age structure is very good.

#### **3.8 Frequency and quality of publications**

The amount of publications is good, around 1 per year and per researcher. Also, the quality is, for the institute as a whole, very good, with about 15 % publications in first-decile and first-quartile journals and about 25 % in second-quartile journals. The fraction of publications ranked in the categories 1 and 2 during the evaluation Phase 1 is about 44 %. This is very good. There are differences in quality of the publications among the departments and laboratories. There are no publications from the department of Materials Structure and Properties in first-decile and first-quartile journals and its

publications were mainly ranked in the evaluation Phase 1 in category 3. These lower ranking is, of course, connected to the more engineering character of the research activities in this department.

### **3.9 Patents and role in contractual work**

There is no precise information for the institute as a whole on patents. But there are patents and there is considerable contract research.

## **4. RECOMMENDATIONS**

### **4.1 Re-organisation of the internal structure of the institute and departments, laboratories, teams and groups considering the critical mass of each unit, the overlap of units**

There is no need to re-organise the internal structure of the institute.

### **4.2 Internal programs to stimulate actions to enforce strengths and to reduce weaknesses**

The institute should think about methods to stimulate the departments in the search for complementary foreign research partners. Increasing structured co-operation with well-chosen partners is scientifically beneficial and increases the possibilities for obtaining funding from EU sources or international sources.

The institute should also think about methods to stimulate the departments with less attention to the ISI-ranking of the journals in publishing more in highly-ranked journals. This will increase the international visibility of these departments and increase their chances in obtaining funding from EU sources and international sources.

### **4.3 Identification of new research topics**

There does not seem a direct need to search for new research topics.

## **5. DETAILED EVALUATION**

### **5.1 Declaration on the quality of the results and share in their acquisition**

#### ***Characterisation of the main research activities (experiments, theoretical areas)***

Activities encompass research of experimental type, modelling type and of data collection and analysis type.

#### ***Relevance in the national and international context***

The research is relevant in the national and international context.

#### ***Overall quality of publications***

The overall quality of the publications is good, with a high fraction of the publications in first-decile and first-quartile journals.

#### ***Specification of the main achievements***

The institute does not claim specific main achievements. But it is clear that the institute has acquired high expertise in all its areas of research.

### ***Specification of the contributions of the team to publications***

Publications are oriented towards the national and international level.

## **5.2 Declaration on the involvement of students in research**

### ***Involvement of students (doctoral, undergraduate) into research***

During the evaluation period, the institute was involved in 37 supervisions of bachelor, master and doctoral students and the number of defended Ph.D. theses with supervision or co-supervision by members of the institute was 15. Further, the institute organises a yearly Ph.D. workshop with presentations by the Ph.D. students with supervisors or co-supervisors of the institute. The evaluation commission judges the involvement of the institute in student supervision as very good.

### ***Particular contributions of students to research***

Ph.D. students contribute to the research.

### ***Number of defended PhD students in relation to students involved (success rate)***

There are 15 defended Ph.D. theses with supervision or co-supervision by members of the institute in the evaluation period. This is a good number.

### ***Employment of former Phd students (career options)***

There is no precise information for the institute as a whole about Ph.D. students who are recruited after finishing their Ph.D. But it is clear that the institute recruits scientists from Ph.D. students.

## **5.3 Declaration on societal relevance**

### ***Impacts of the results and other activities on economy***

There is certainly a significant contribution to the economy by the activities of the institute, but it is difficult to quantify it.

### ***Impacts of the results and other activities on education***

The contribution of the institute to education is significant, by providing lecturers to several universities, as well as supervisors on the bachelor, masters and doctoral student levels.

### ***Services for research (libraries, data bases, collections,...)***

The institute has a large library which can also be used by external researchers.

### ***Popularisation and similar activities***

The institute does a big effort on popularisation of science. There are contributions to TV and radio programmes and it produces press releases. It participates in the science week of the Academy of

Sciences and it organises thematic exhibitions. The evaluation commission judges the effort of the institute in science popularisation as very good.

#### **5.4 Declaration on the position in the international and national context**

##### ***Comparison of the position, recognition, outputs and impacts with leading and international teams***

The number of journal publications in journals of the highest quality (first-decile and first-quartile) is good for the institute as a whole. The institute should stimulate the research teams with less attention to journal ranking to orient publications more towards highly-ranked journals.

##### ***Role and position in international collaboration***

There are no international collaborations with funding from international origin. The institute should do an effort in identifying strong foreign partners with whom targeted collaborations can be set up. Such collaborations can then be a good basis for submitting international research proposals. The institute plans already such collaborations.

#### **5.5 Declaration on the vitality and sustainability**

##### ***Composition of staff with respect to age and gender, qualification, international experience***

The composition of the staff is well balanced with respect to age, gender, qualification and international experience.

##### ***Attraction of research programmes for young people***

The research programmes seem all very attractive to the evaluation commission. But the institute reports difficulties in recruiting young people in some research teams. This must be caused by factors outside the influence of the institute.

##### ***Funding (structure of the resources and its comparison with the outputs, grants and project activity)***

The sources of the funding are well balanced. But, there is clearly a need to focus more on funding of international nature.

##### ***Effectiveness of research (based on comparing size of groups, funding and output)***

The number of publications per FTE and per year of the institute is good. The quality is also very good, for the institute as a whole.

#### **5.6 Declaration on the strategy and plans for the future**

##### ***Relevance of the outlined strategy and research plans***

Generally, the institute plans to continue research of the same character as done now. This point of view seems all right to the evaluation commission.

***Adequacy of available means and human resources to achieve these plans***

The institute participates in five Strategy AV21 projects of the Academy of Sciences, implying co-operation with research teams of other institutes of the Academy of Sciences. These projects guarantee already substantial funding for equipment. There remains the need to acquire funding for salaries. The institute mentions that an effort will be done to set up targeted co-operations with European research teams with the objective to acquire funding by EU-projects. But no details are given on the realism of these initiatives.

***Missing issues in the strategy***

There are no missing issues, provided that the institute is serious about setting up strategic co-operations with foreign research teams with the objective of acquiring funding from EU sources.



## **B. Evaluation of the individual teams**

### **Evaluation of the Team No. 1: Laboratory of Structure, Properties and Processing of Materials**

#### **1. INTRODUCTION**

##### **1.1 Structure and location of the laboratory**

The laboratory of Structure, Properties and Processing of Materials is one of the two laboratories of the department of Material Structure and Properties of the institute of Rock Structure and Mechanics and is located in Prague.

##### **1.2 Mission and research topics**

The research topics of the laboratory are in the areas of processing of waste materials into useful products, synthesis and characterisation of geopolymer materials, characterisation of magnetic materials. The research is mainly of fundamental nature, but with strong industrial applicability.

##### **1.3 Staff size and full time equivalents age distribution**

The number of research staff of the laboratory itself is on average about 5.3 FTE during the evaluation period. There is supplementary contribution by Ph.D. students of the order of 1. The research team of the laboratory itself is rather small. The total number of physical persons on 31 December 2014 is 8. There are 3 researchers in the age category 65-70 years and 5 persons spread among the categories 25-55 years.

#### **2. STRENGTHS AND OPPORTUNITIES**

##### **2.1 Topicality of research subjects**

The research topics of the laboratory are fundamental, but have high practical value.

##### **2.2 Budget: Ratio of institutional budget, grants and contractual resources, international funds**

The laboratory acquired funding during the evaluation period from the Czech Science Foundation, the Czech Technology Agency and a small amount of contract research projects. There is no funding by EU-projects. About 30 % of the budget comes from outside the Academy of Sciences.

##### **2.3 National collaboration and international involvement**

The laboratory collaborates with research teams of the University of Chemistry and Technology in Prague and the Czech University of Life sciences in Prague. There is no collaboration with foreign research teams.

##### **2.4 Frequency and quality of publications**

The number of publications of the laboratory is moderately high. In the evaluation period, there are 23 publications in journals with impact factor, 12 other journal publications, 15 conference papers and 1 book chapter. There was an error in evaluation phase I because these two papers should be considered as publications in first quartile journals. In phase 1 of the evaluation, these two papers were not considered in this category and, very likely, were put in the category of second-quartile journals. About 30 % of the journal publications are in second-quartile journals, the others in lower

ranked journals. The number of citations is low, but this is quite normal for recent publications. The laboratory published for about 1/3 in international journals and for the other 2/3 in local journals. So, the laboratory is quite strongly oriented to the national level.

### **2.5 Patents and role in contractual work**

The laboratory acquired 4 patents during the evaluation period. This is very good. There is only very limited contractual research.

## **3. WEAKNESSES AND THREATS**

### **3.1 Topicality of research subjects**

The research topics of the laboratory are extremely relevant on the fundamental level and towards industrial use. There are no weaknesses and threats related to research topics.

### **3.2 Budget: Ratio of institutional budget, grants and contractual resources, international funds**

The funding sources are solely on the national level in the evaluation period. This is clearly a threat.

### **3.3 Intensity of national collaboration and international involvement**

There are collaborations on the national level with two universities. These seem to be very fruitful. But there are no international collaborations.

### **3.4 Capacity of the staff**

The number of staff members is small. This is clearly a threat. Moreover, 3 of the 8 physical persons are in the age category of 65-70 years. Their replacement cannot be very far away.

### **3.5 Frequency and quality of publications**

The number of publications is good, but, the overall quality of the publications is not very high in the sense that there are no publications in first-decile and first-quartile journals and that the number of citations is low. Judged on the description of the research projects, a foreign reviewer can conclude that the quality of the research is, in general, quite high as seen on the national level. But the international value cannot be fully assessed by a foreign evaluator who is not exactly in the same research field. Publishing in highly-ranked journals increases the international visibility and is a necessity for obtaining funding on the European level.

### **3.6 Patents and role in contractual work**

There are no weaknesses and threats related to patents. There is only limited contract research, but this may not be necessary.

## **4. RECOMMENDATIONS**

### **4.1 Re-organisation of the internal structure of the departments, laboratories, teams and groups considering the critical mass of each unit, the overlap of units**

Re-organisation of the laboratory is not a relevant subject. The laboratory is a small research team.

### **4.2 Internal programs to stimulate actions to enforce strengths and to reduce weaknesses**

Strict internal programs cannot be a subject in a small research team. The laboratory should think about identifying a limited number of complementary foreign research partners, with whom strong collaboration can be set up and who can be partners in EU-funded projects. The laboratory should start recruiting one or two young post-doctoral researchers, anticipating the replacement of the older researchers. This requires, of course, supplementary funding, that very likely cannot be obtained on the national level.

#### **4.3 Identification of new research topics**

There is no need to search for new research topics.

### **5. DETAILED EVALUATION**

#### **5.1 Declaration on the quality of the results and share in their acquisition**

##### *Characterisation of the main research activities (experiments, theoretical areas)*

Research activities are mainly experimental. A limited fraction of the research is data gathering from literature.

##### *Relevance in the national and international context*

The research is very relevant in the national and international context.

##### *Overall quality of publications*

The overall quality of the publications can be improved.

##### *Specification of the main achievements*

The laboratory has acquired expertise in several techniques for extraction of useful products from waste materials. The laboratory has also expertise in characterisation of geopolymer and magnetic materials.

#### **5.2 Declaration on the involvement of students in research**

##### *Involvement of students (doctoral, undergraduate) into research*

Ph.D. students are involved in the research projects of the laboratory. But the number of Ph.D. students in the own research projects of the laboratory is limited.

##### *Number of defended PhD students in relation to students involved (success rate)*

There are 3 defended Ph.D. theses with co-supervision by members of the laboratory and there are 3 ongoing Ph.D. theses with co-supervision. This are very good numbers.

##### *Employment of former Ph.D. students (career options)*

There is no information by the laboratory on recruitment during the evaluation period of Ph.D. students with whom members of the laboratory have had contact during the Ph.D. work. But, it seems natural that the younger researchers have been recruited from this category of Ph.D. students.

### **5.3 Declaration on societal relevance**

#### ***Impacts of the results and other activities on economy***

There is certainly a contribution to the economy by the activities of the laboratory.

#### ***Impacts of the results and other activities on education***

The laboratory does not participate in teaching, only in supervision of doctoral students. The explanation by the laboratory is that its research topics are nowhere subject of courses at universities.

#### ***Popularisation and similar activities***

The laboratory does not report explicitly activities of popularisation of science towards young people. The laboratory reports a large number of activities towards scientific communities.

### **5.4 Declaration on the position in the international and national context**

#### ***Comparison of the position, recognition, outputs and impacts with leading and international teams***

Publications in journals of the highest quality (first-decile; first-quartile) are absent. This limits the international visibility of the laboratory.

#### ***Role and position in international collaboration***

There are no collaborations with foreign research teams. The laboratory should do an effort in identifying a limited number of foreign complementary partners for intense collaboration. This is very likely beneficial for the quality of the research and certainly helps much in obtaining funding on the international level.

### **5.5 Declaration on the vitality and sustainability**

#### ***Composition of staff with respect to age and gender, qualification, international experience***

Recruiting one or two young post-doctoral researchers, anticipating the replacement of the older researchers seems advisable.

#### ***Attraction of research programmes for young people***

The research programmes seem very attractive for young people.

***Funding (structure of the resources and its comparison with the outputs, grants and project activity)***

Funding of the laboratory is solely on the national level up to now.

***Effectiveness of research (based on comparing size of groups, funding and output)***

The output of the laboratory in number of publications and patents is very good.

**5.6 Declaration on the strategy and plans for the future**

***Relevance of the outlined strategy and research plans***

The research plans for the near future are very good. The targeted research is a natural continuation of the past research.

***Adequacy of available means and human resources to achieve these plans***

The capabilities of the existing research team are very good. Supplementary recruitment of some young researchers is advisable. This may be possible with the planned submission of projects to the Czech Science Foundation, the Czech Technology Agency, the Czech Agency for Agriculture Research, and other sources on the national level.

***Missing issues in the strategy***

The laboratory does not envisage setting up strategic co-operations with foreign research teams and does not target to acquiring funding from EU sources.

## **Evaluation of the Team No. 2: Laboratory of Inorganic Materials**

### **1. INTRODUCTION**

#### **1.1 Structure and location of the laboratory**

The laboratory of Inorganic Materials is one of the two laboratories of the department of Material Structure and Properties of the institute of Rock Structure and Mechanics. It is operated as a joint laboratory with the Faculty of Chemical Technology of the University of Chemistry and Technology in Prague. The laboratory is the result of a restructuring of the institute and functions since 2012. So, the evaluation period spans 3 years: 2012-2014.

#### **1.2 Mission and research topics**

The research topics of the laboratory are related to the glass industry. One research area is physical chemistry and chemical engineering of the glass melting process. A second research area is preparation and analysis of properties of infrared transmitting glass. The research is of fundamental nature, but with strong industrial applicability.

#### **1.3 Staff size and full time equivalents age distribution**

The number of research staff of the laboratory itself is on average about 3.3 FTE during the evaluation period. There is supplementary contribution by Ph.D. students to the research. The research team of the laboratory itself is very small. The total number of physical persons, including 4 Ph.D. students on 31 December 2014 is 10. 8 researchers are younger than 40 years. There is 1 person in the age category 50-55 and one person older than 70 years.

### **2. STRENGTHS AND OPPORTUNITIES**

#### **2.1 Topicality of research subjects**

The research topics of the laboratory are very fundamental, but, yet, have high practical value for the glass industry.

#### **2.2 Budget: Ratio of institutional budget, grants and contractual resources, international funds**

The laboratory acquired funding during the evaluation period from the Czech Science Foundation, the Czech Ministry of Education, Youth and Sports and an EU Cost action. The funding is mainly on the national level.

#### **2.3 National collaboration and international involvement**

The laboratory collaborates with research teams of another institute of the Academy of Sciences, with the University of Chemistry and Technology in Prague, with the Slovak Technical University and with the University of Rennes 1 (France). The international collaboration is, however, limited, and related to a Cost Association.

#### **2.4 Frequency and quality of publications**

The number of publications of the laboratory is very high. In the evaluation period, there are 16 publications in journals with impact factor, realised with a team of about 3.3 FTE during 3 years.

6 of the 16 journal publications in journals with impact factor should be considered as publications in first-quartile journals. In phase 1 of the evaluation, these were not considered in this category and, very likely, were put in the category of second-quartile journals. The quality judgement in phase 1 on the publications is very confusing. Four journal papers were selected for quality ranking and all put in category 3. So, the information on the publications is contradictory and it is not possible to come to a clear judgement, based on the way the commission has to work.

The number of citations is low, but this is quite normal for recent publications. The laboratory published for about 50 % in international journals and for the other 50 % in local journals. So, the laboratory is quite strongly oriented to the national level.

### **2.5 Patents and role in contractual work**

The laboratory acquired 3 patents during the evaluation period. This is very good. There is no contractual research.

## **3. WEAKNESSES AND THREATS**

### **3.1 Topicality of research subjects**

The research topics of the laboratory are extremely relevant on the fundamental level and towards industrial use. There are no weaknesses and threats related to research topics.

### **3.2 Budget: Ratio of institutional budget, grants and contractual resources, international funds**

The funding sources are mainly on the national level in the evaluation period. This is clearly a threat.

### **3.3 Intensity of national collaboration and international involvement**

There are collaborations with two other European university teams, but these are not intense. That there are only two collaborations with foreign teams is, as such, not a weakness; taking into account that the laboratory research team is small. But the low intensity of the collaborations is a weakness.

### **3.4 Capacity of the staff**

The number of staff members is very small. This is clearly a threat. A positive aspect is that staff members are quite young.

### **3.5 Frequency and quality of publications**

The number of publications is very good, but, the overall quality of the publications is not very high in the sense that there are no publications in first-decile and first-quartile journals and that the number of citations is low. Judged on the description of the research projects, a foreign reviewer can conclude that the quality of the research is, in general, quite high as seen on the national level. But the international value cannot be fully assessed by a foreign evaluator who is not exactly in the same research field. Publishing in highly-ranked journals increases the international visibility and can help much in obtaining funding on the European level.

### **3.6 Patents and role in contractual work**

There are no weaknesses and threats related to patents. There is no contractual work, but this may be not necessary.

#### **4. RECOMMENDATIONS**

##### **4.1 Re-organisation of the internal structure of the departments, laboratories, teams and groups considering the critical mass of each unit, the overlap of units**

Re-organisation of the laboratory is not a relevant subject. The laboratory is a small research team.

##### **4.2 Internal programs to stimulate actions to enforce strengths and to reduce weaknesses**

Strict internal programs cannot be a subject in a small research team. The laboratory should think about identifying a limited number of complementary foreign research partners, with whom strong collaboration can be set up and who can also be partners in EU-funded projects. It may be that intensification of the existing collaborations can serve this goal. The laboratory should start recruiting one or two young post-doctoral researchers, in order to increase somewhat the size of the research team. This requires, of course, supplementary funding, that very likely cannot be obtained on the national level.

##### **4.3 Identification of new research topics**

There is no need to search for new research topics.

#### **5. DETAILED EVALUATION**

##### **5.1 Declaration on the quality of the results and share in their acquisition**

###### ***Characterisation of the main research activities (experiments, theoretical areas)***

Research activities are experimental and numerical.

###### ***Relevance in the national and international context***

The research is very relevant in the national and international context.

###### ***Overall quality of publications***

The overall quality of the publications can be improved.

###### ***Specification of the main achievements***

The laboratory has acquired a high expertise in mathematical modelling of glass melting and in preparation and characterisation of infrared transmitting glass types.

##### **5.2 Declaration on the involvement of students in research**

###### ***Involvement of students (doctoral, undergraduate) into research***

Ph.D. students are involved in the research projects of the laboratory.

###### ***Number of defended PhD students in relation to students involved (success rate)***



There are 2 defended Ph.D. theses with supervision by members of the laboratory and 2 defended Ph.D. theses with co-supervision. This is a very good number.

#### ***Employment of former Ph.D. students (career options)***

There is no detailed information by the laboratory on recruitment during the evaluation period of Ph.D. students with whom members of the laboratory have had contact during the Ph.D. work. But from the general description, one can deduce that some of the younger researchers are former Ph.D. students. So, recruitment possibilities by the department and career possibilities of former Ph.D. students seem very good.

### **5.3 Declaration on societal relevance**

#### ***Impacts of the results and other activities on economy***

There is certainly a contribution to the economy by the activities of the laboratory.

#### ***Impacts of the results and other activities on education***

The laboratory participates in education on the bachelor, masters and doctoral level

#### ***Popularisation and similar activities***

The laboratory participates in activities of popularisation of science.

### **5.4 Declaration on the position in the international and national context**

#### ***Comparison of the position, recognition, outputs and impacts with leading and international teams***

Publications in journals of the highest quality (first-decile; first-quartile) are absent. This limits the international visibility of the laboratory.

#### ***Role and position in international collaboration***

There are no intense collaborations with foreign research teams. The laboratory should do an effort in identifying complementary partners for intense collaboration or intensifying the collaboration with the two existing partners. This may be beneficial for the quality of the research and may help in obtaining funding on the international level.

### **5.5 Declaration on the vitality and sustainability**

#### ***Composition of staff with respect to age and gender, qualification, international experience***

The research team is quite young. There is no problem with age structure.

#### ***Attraction of research programmes for young people***

The research programmes seem very attractive for young people.

***Funding (structure of the resources and its comparison with the outputs, grants and project activity)***

Funding of the laboratory is mainly national up to now. The laboratory should consider targeting to funding from EU sources.

***Effectiveness of research (based on comparing size of groups, funding and output)***

The output of the laboratory in number of publications and patents is very good.

**5.6 Declaration on the strategy and plans for the future**

***Relevance of the outlined strategy and research plans***

The research plans for the near future are very good. The targeted research is a natural continuation of the past research.

***Adequacy of available means and human resources to achieve these plans***

The capabilities of the existing research team are very good. Supplementary recruitment of researchers is advisable in order to increase the size of the research team somewhat. Obtaining supplementary funding will be necessary for this goal.

***Missing issues in the strategy***

The laboratory does not envisage setting up strategic co-operations with foreign research teams and does not target to acquiring funding from EU sources.

## **Evaluation of the Team No. 3: Department of Composites and Carbon Materials**

### **1. INTRODUCTION**

#### **1.1 Structure and location of the department**

The department of Composites and Carbon Materials is part of the institute of Rock Structure and Mechanics and is located in Prague.

#### **1.2 Mission and research topics**

The research topics of the department are centred during the evaluation period around modern fibrous, particulate, and hybrid composite materials on the basis of synthetic or natural materials. These activities are divided in two groups: (1) composite materials for tissue engineering and medicine and (2) heat-resistant composites.

#### **1.3 Staff size and full time equivalents age distribution**

The number of research staff of the department itself is on average about 5.9 FTE during the evaluation period. There is a modest supplementary contribution by Ph.D. students to the research. So, the research team is very small. There are 4.4 FTE persons in the age category of 35-45 and 1.5 FTE persons in the age category above 65.

### **2. STRENGTHS AND OPPORTUNITIES**

#### **2.1 Topicality of research subjects**

The research topics of the department are very fundamental, but, yet, have high practical value for a number of medical and industrial applications.

#### **2.2 Budget: Ratio of institutional budget, grants and contractual resources, international funds**

The department acquired funding during the evaluation period from the Czech Science Foundation, the Czech Technology Agency and from a limited number of small contract research projects. There is no funding from EU or international origin.

#### **2.3 National collaboration and international involvement**

The department collaborates with research teams of two other institutes of the Academy of Sciences, with the Faculty of Mechanical Engineering of the Czech Technical University in Prague and with local industrial partners. The department mentions also collaborations with foreign universities and foreign research institutes, but these collaborations seem to be rather loose since these foreign teams do not participate directly in the research projects of the department.

#### **2.4 Frequency and quality of publications**

The number of publications of the department is very high. In the evaluation period, there are 34 publications in journals with impact factor, 3 chapters in books and 10 conference contributions; this all, with a team of about 5.9 FTE. The level of the journals is also very good. 45 % of the journal publications are in first-decile, first-quartile and second-quartile journals. The publications that were ranked in Phase 1 of the evaluation were all from these high-level journals and were put for ¼ in class

2 and  $\frac{3}{4}$  in class 3. The number of citations is not very high, but this is normal for recent publications. So, overall, quantity and quality of the publications are very good.

### **2.5 Patents and role in contractual work**

The department does not list patents as scientific outputs, but from the publication list, one can deduce that the department probably has 5 patents in the evaluation period. This is very good.

## **3. WEAKNESSES AND THREATS**

### **3.1 Topicality of research subjects**

The research topics of the department are extremely relevant on the fundamental level and towards medical and industrial use. There are no weaknesses and threats related to research topics.

### **3.2 Budget: Ratio of institutional budget, grants and contractual resources, international funds**

The funding sources are all on the national level in the evaluation period. This is clearly a threat.

### **3.3 Intensity of national collaboration and international involvement**

There are no structured collaborations with foreign research institutes and university teams. There are even no project-type collaborations within EU-projects or international projects.

### **3.4 Capacity of the staff**

The number of staff members is very small and a quarter of it is above 65 years old. This is clearly a threat. Search for a few young researchers on the post-doctoral level is necessary.

### **3.5 Frequency and quality of publications**

There are no weaknesses and threats related to publications.

### **3.6 Patents and role in contractual work**

There are no weaknesses and threats related to patents and contractual work.

## **4. RECOMMENDATIONS**

### **4.1 Re-organisation of the internal structure of the departments, laboratories, teams and groups considering the critical mass of each unit, the overlap of units**

Re-organisation of the department is not a relevant subject. The department is a small research team.

### **4.2 Internal programs to stimulate actions to enforce strengths and to reduce weaknesses**

Strict internal programs cannot be a subject in a small research team. The department should think about the opportunity of identifying a limited number of complementary foreign research partners, who can also be partners in EU-funded projects. The department should start recruitment of a few young post-doctoral researchers. The department is aware of this necessity.

### **4.3 Identification of new research topics**

There is no need to search for new research topics. The number of research topics planned for the next future (5) is already quite high for the small research team.

## **5. DETAILED EVALUATION**

### **5.1 Declaration on the quality of the results and share in their acquisition**

#### ***Characterisation of the main research activities (experiments, theoretical areas)***

Research activities are experimental.

#### ***Relevance in the national and international context***

The research is very relevant in the national and international context.

#### ***Overall quality of publications***

The overall quality of the publications is very good.

#### ***Specification of the main achievements***

The department has acquired a high expertise in composite materials for tissue engineering and medicine and in heat-resistant composites.

### **5.2 Declaration on the involvement of students in research**

#### ***Involvement of students (doctoral, undergraduate) into research***

There does not seem to be strong direct involvement of Ph.D. students in the research projects that are done in the department itself.

#### ***Number of defended PhD students in relation to students involved (success rate)***

There are 3 defended Ph.D. theses with co-supervision by members of the department in the evaluation period. This is a very good number.

#### ***Employment of former Ph.D. students (career options)***

There is no information by the department on recruitment during the evaluation period of Ph.D. students with whom members of the department have had contact during the Ph.D. work. But since the department mentions necessity to recruit post-doctoral researchers in the period of 2015-2019, it seems natural that these Ph.D. students will be contacted for recruitment by the department. The department mentions this possibility.

### **5.3 Declaration on societal relevance**

#### ***Impacts of the results and other activities on economy***

There is certainly a contribution to the economy by the activities of the department.

#### ***Impacts of the results and other activities on education***

The department participates in education.

### ***Popularisation and similar activities***

The department participates in activities of popularisation of science.

## **5.4 Declaration on the position in the international and national context**

### ***Comparison of the position, recognition, outputs and impacts with leading and international teams***

The department publishes in journals of the highest quality (first-decile; first and second quartile). This means that the work of the department is internationally well visible.

### ***Role and position in international collaboration***

There are no structured collaborations with foreign research teams. The department should do an effort in identifying partners. This may be beneficial for the quality of the research and may help in obtaining funding on the European or international level.

## **5.5 Declaration on the vitality and sustainability**

### ***Composition of staff with respect to age and gender, qualification, international experience***

There are 1.5 FTE members of the department with age above 65 years. Replacement of these researchers cannot be very far away.

### ***Attraction of research programmes for young people***

The research programmes seem very attractive for young people.

### ***Funding (structure of the resources and its comparison with the outputs, grants and project activity)***

Funding of the department is purely national up to now. The department should consider targeting to funding from EU sources.

### ***Effectiveness of research (based on comparing size of groups, funding and output)***

The output of the department in number of publications and patents is very good.

## **5.6 Declaration on the strategy and plans for the future**

### ***Relevance of the outlined strategy and research plans***

The research plans for the near future are very good. The targeted research is a natural continuation of the past research.

### ***Adequacy of available means and human resources to achieve these plans***

The capabilities of the existing research team are very good. Supplementary recruitment of researchers will be necessary. Obtaining supplementary funding will also be necessary.

***Missing issues in the strategy***

The department does not envisage setting up strategic co-operations with foreign research teams and does not target to acquiring funding from EU sources.

**Date:** February 28, 2016

**Commission Chair:** em Prof.DI.Dr.Dr.hc. Hans Peter Nachtnebel