

ERC Starting Grant 2010 Step 2 Evaluation Report

CONFIDENTIAL

Call reference	ERC-2010-StG
Activity	ERC Starting Grant
Funding scheme	ERC Starting Grant
Panel name	PE8 - Products and process engineering
Proposal No.	258588
Acronym	FreeCo
Panel decision on Career Stage	Starter
Applicant Name	Sylvain DEVILLE
Title	Freezing Colloids

PANEL MARKS

1. Principal Investigator Quality of research output/track-record: <i>How well qualified is the Principal Investigator to conduct the project (reviewers are expected to evaluate the quality of the prior work such as published results in top peer review journals as well as other elements of the Principal Investigator's CV), taking into account the early or more mature phase of his/her transition to independence, as well as prior career breaks and/or unconventional research career paths (especially in the case of women scientists). To what extent are the publications and achievements of the Principal Investigator groundbreaking and demonstrative of independent creative thinking and capacity to go significantly beyond the state of the art? Taking account of the particular circumstances of the Principal Investigator and the proposed research, including any funding already secured, to what extent will an ERC Starting Grant make a significant contribution to the establishment or consolidation of independence?</i>	3.5 / 4
2. Research project Ground-breaking nature of the research: <i>Does the proposed research address important challenges at the frontiers of the field(s) addressed? Does it have suitably ambitious objectives, which go substantially beyond the current state of the art (e.g. including inter- and trans-disciplinary developments and novel or unconventional concepts and/or approaches)? How well conceived and organized is the proposed activity?</i> Potential impact: <i>(a) Does the research open new and important, scientific, technological or scholarly horizons?</i> <i>(b) Will the project significantly enhance the research environment and capabilities for frontier research in Europe (including the host institution)?</i> Methodology: <i>Is the proposed research methodology (including when pertinent the use of instrumentation, other type of infrastructures etc.) comprehensive and appropriate to the project? Will it enable the goals of the project convincingly to be achieved within the proposed timescales and resources (including the costs of the Principal Investigator and the members of the team who will be engaged in the project) and the level of risk associated with a challenging research project?</i> High-gain/High-risk balance: <i>a) does the proposed research involve highly novel and/or unconventional methodologies, whose high risk is justified by the possibility of a major breakthrough with an impact beyond a specific research domain/discipline?</i>	2.88 / 4
Total mark	6.38 / 8
Has the proposal passed the thresholds (2/4) for criteria 1 and 2?	Yes

3. Research Environment**Contribution of the research environment to the project:**

Does the host environment provide most of the infrastructure necessary for the research to be carried out? Is it in a position to provide an appropriate intellectual environment and infrastructural support and to assist in achieving the ambitions for the project and the Principal Investigator?

Participation of other legal entities:

If it is proposed that other legal entities participate in the project, in addition to the applicant legal entity, is their participation fully justified by the scientific added value they bring to the project?

passed**PANEL COMMENT**

This evaluation report contains the final marks awarded by the ERC review panel during the second step of the ERC Starting Grant review. The panel based its appraisal on prior individual reviews conducted by panel members and external referees, and the interview with the applicant.

The panel closely examined all the individual review reports and, while not necessarily subscribing to each and every opinion expressed, found that they provide a fair overall assessment. The comments of the individual reviewers are included in this report. The presentation given by the applicant during the interview and the answers to the questions that were addressed greatly contributed to build the panel's view about the proposal's strengths and weaknesses.

Both the individual reviews and the interview were the basis for the discussion and the final recommendation of the panel.

The applicant shows a good background and showed to have a substantial scientific ability to conduct research in the indicated area. However, although being a fascinating subject, the proposed research project is laid out too broadly and a clear structure in the workplan is missing. The panel is afraid that the high abilities of the applicant get lost amid an unstructured research process. It is suggested that the applicant revises his proposal to come to a much more focussed research plan. He should also explain the methodology used in a clearer way and more critically.

The panel therefore considers the proposal of good quality, however at a relatively low position in the ranked list.

REVIEWER COMMENTS**Reviewer 1****1. Principal Investigator:****Quality of research output / track-record:**

The applicant has received her Ph.D. in Material Science from INSA in Lyon, then spent 2 years as a post-doc in Berkeley at LBNL and is now working in a tenured position at the CNRS, Cavaillon. She has an excellent background for the proposed project. She has gained a position that should enable her to do quite independent work.

Publications and achievements:

Her publication record can be considered very good regarding the quality of the journals and the number of publications; she has published in very good journals including Science. She also has some patent applications. Her previous work points out the importance of material science in biomedical applications.

Establishment or consolidation of independence:

Most of her published work was after her Ph.D.; the position at CNRS gives her some independence; the ERC grant would help her to increase this further.

2. Research project:**Ground breaking nature of research:**

The subject of the proposed research work is fascinating and definitely of high importance. As described by the applicant, the occurrence of "frozen colloids" plays an important role in various areas of nature but also in technology. A considerably improved understanding is highly desirable.

Potential impact:

Assuming the research is successful it would have a bearing on various areas of application being able to work with much refined understanding; so it has a high potential in science and application.

High-gain/High-risk balance:

The highest risk lies in the broadness and missing focus of the proposed research. Half of the proposed program would have been sufficient. The danger is that the applicant gets lost and, thus, defocused in the number of partial projects.

Methodology:

The methodology to be applied is not that clear, occasionally it is being described, mostly it is quite general. There are no clear work plans and there are way too many partial projects to be covered. While the principal idea to combine experimental work with simulation is good, it is not clear how physical parameters for the simulation are obtained from the experiments. There is no critical discussion of the experimental techniques to be employed; the descriptions are too general.

3. Research environment:**Contribution of the research environment to the project:**

The host institution is surely an excellent place for doing this kind of work, from the experimental point of view and also intellectually.

Reviewer 2**1. Principal Investigator:****Quality of research output / track-record:**

The applicant has an excellent track record given his young age. He stayed as a postdoc at Lawrence Berkeley Ntl.Lab. and is currently a tenured researcher of CNRS. He has a very impressive publication list, both in terms of quantity and quality.

Publications and achievements:

The applicant has published 13 articles, most of them in international top journals (Adv.Mater., Nature Mater., Science, Nanoletters, etc.). He is the first author in the majority of these articles; this indicates that he had a leading role in this research. Especially (but not only) the Science paper from 2006 is groundbreaking and has been cited 141 times (at the end of March 2010).

Establishment or consolidation of independence:

The Starting Grant would definitely allow the applicant to establish this topical area of research in Europe and allow him to set up an independent research group within CNRS.

2. Research project:**Ground breaking nature of research:**

This is an excellent proposal, at the borderline between basic and applied science. The project is aiming at a basic understanding of the "freezing colloids" issue (including modelling), as well as developing selected applications. The overall goals are very challenging.

Potential impact:

Success of this project would have major impact on the development of new materials, as well as understanding (and eventually controlling) of freezing-related phenomena in soil, sea water, cells, etc.

High-gain/High-risk balance:

The strength of the proposal is a brilliant idea, i.e. how a common phenomenon can be utilized for the development of new materials, once the basic processes have been investigated and understood. The applied methods are state-of-the-art. There is a "gradient of risks" (in the proposer's words) meaning that there is little risk that the project fails completely, but a significant risk for the success of technological applications. In any case, major breakthrough in our understanding of freezing colloids can be expected.

Methodology:

The proposed methodology is appropriate. A drawback of the proposal is that it is too broad and over-ambitious. The applicant gives the impression that he wants to solve all problems and to utilize all opportunities associated with the "freezing colloids" issue within the limited time period of the grant (this will be impossible), instead of focussing on some specific issues. Thus, there is a lack of details, such as the kind of colloids to be investigated, side conditions, timeframe, etc.

3. Research environment:

Contribution of the research environment to the project:

The CNRS laboratory is a joint laboratory with one of Saint-Gobain R&D centers. Therefore it is save to assume that there is a very good infrastructure support.

Reviewer 3

1. Principal Investigator:

Quality of research output / track-record:

The P.I. was graduated to Ph.D. at INSA Lyon in 2006 at the young age of 26. A 2 years' stay as a Postdoctoral Fellow at the Materials Science Division of Lawrence Berkeley National Lab, USA, demonstrates his academic mobility. His position as a tenured researcher at CNRS allows him to devote most of his time to research. In spite of his young age he is already in a more mature phase of his transition to scientific independence. Based on his excellent/outstanding research output and track record, the P.I. is considered to be very well qualified to conduct the project.

Publications and achievements:

The scientific output of the P.I. consists of 27 peer-reviewed papers, 13 of which are listed in what he refers to as "selection of publications". 4 of these papers are co-authored by his Ph.D. supervisor. The P.I. is the first author of 9 of the 13 papers of the mentioned list. One of his papers appeared in Science and received 114 citations. Some of his works can be considered as ground-breaking. His record of acquisition of funded research is excellent.

Establishment or consolidation of independence:

In his assessment of the specific stage of his career the P.I. says " ... I am now one of the world leaders of these investigations in materials science with plenty of ideas and approaches to implement and yet little means to do so ...". This statement corroborates my impression that an ERC Starting Grant will definitely make a significant contribution to the establishment of the P.I.'s independence as a researcher.

2. Research project:

Ground breaking nature of research:

The proposed research is multi-disciplinary, involving chemistry, physics, and mathematics in addition to materials science which is the core research field. The project addresses important challenges at the frontiers of materials sciences. The implications of freezing colloids beyond materials science may be indeed far reaching. The objectives are very ambitious, maybe even too ambitious. The project is very well conceived and organized. A feature of the project organization is a "gradient of risk at several levels", characterized by a combination of "conventional and novel approaches in observation techniques, modelling and materials processing ...". What is missing is the definition of milestones allowing to assess the feasibility of reaching them in the specified time periods.

Potential impact:

Because of its wide scope, the great scientific relevance, and its high potential for technological progress the proposed research project opens new and important scholarly and technological horizons. As regards the latter, soil freezing in geotechnical engineering is a technological field on which the project might have a great impact. There is a good change that the project will significantly enhance the research environment and capabilities for frontier research in Europe.

High-gain/High-risk balance:

The proposed research involves new methodologies. Their combination with conventional approaches mitigates the risk of the project. Therefore, and also because of the great experience of the P.I. in the field of freezing of colloids, there is an imbalance in favour of the high gain to be expected from a successful realization of the project.

Methodology:

Important elements of the methodology are the observation of the freezing of colloids in situ, control and modelling of this process, its scientific application to materials science and its technological application to the removal of pollutants for indoor air quality. With exception of the description of modelling, which could have been more specific, the presentation of the methodology is excellent and convincing. The information on the size of the research team and on the scientific profiles of the researchers who will be involved is sufficient to dispel original reservations, raised in Step 1, caused by lack of such information. Without specification of milestones and time periods required to reach them it is difficult to assess whether or not the individual goals of the project can be reached convincingly. In any case, the potential impact of the project will be very great even if the very ambitious scientific program cannot be fully accomplished.

3. Research environment:

Contribution of the research environment to the project:

The Centre National de la Recherche Scientifique (CNRS), at which the PI holds a permanent position, is an excellent host for the proposed research project. CNRS is known to encourage multidisciplinary research involving collaboration of specialists from different disciplines. The CNRS Lab at Cavaillon, representing the P.I.'s professional location, is a joint lab, with the French company Saint-Gobain as the industrial partner. The P.I. will certainly receive the support needed for realization of his ambitious multidisciplinary research program. The excellent research environment at the Oxford Centre for Collaborative Applied Mathematics where mathematical modelling and numerical work will be carried out will contribute significantly to the success of the project.

Reviewer 4

1. Principal Investigator:

Quality of research output / track-record:

Since his PhD in 2005 the PI has had the good fortune to work for 2 years (2004 to 2006) at LBNL in the USA in one of the best materials science groups in the world. He must have been an exceptionally studious and ambitious post-doc to have reached as far as he apparently has with e.g. a publication in Science and one in Nature Materials (out of 13 papers with very good citation record listed in the application p. 5 B1. Why does he not list all the 27 peer reviewed papers mentioned on p.4 in B1?). He is now back in France working at CNRS.

At the moment he supervises one PhD student. If the project is funded this will increase with 2 PhD students, and 6 (!) post-docs. Although the PI is an enthusiastic and probably a very inspiring coach it may be questioned if he is yet ready to take on such a large research team.

Publications and achievements:

The work of the PI has until now benefitted tremendously by his work in large research groups. This is perhaps also the reason why no paper has yet to be published with the PI as the sole or at least the key-author. The publication record is good, considering that two of the 13 included papers (again: why not list all the papers?) are very desirable outlets for research results. "ground-breaking" is not quite the word to use for the Science paper, but it has certainly created a lot of publicity (as often happens with Science papers where the title is "catchy")

Establishment or consolidation of independence:

The PI who considers himself to "have launched a new field of research in the US" is understandably not happy with his present position (since 2006) as researcher at CNRS with a single PhD student to help him take on the many research possibilities in frozen colloids that made his work at LBNL so interesting. The receipt of an ERC Starter grant would immensely improve his situation, and perhaps be the only way in which he can realize his dreams, and his obvious talents for research.

2. Research project:

Ground breaking nature of research:

When water freezes colloids dispersed in the water will be trapped in a certain structure. When subsequently the water is removed, e.g. by vacuum sublimation the colloid structure remains. This structure can have interesting and highly beneficial properties. Thus, the freezing water has acted as a template for forming the structure of the material. There are, indeed, many potential applications of this technology listed in the proposal, and some of these ought to be exploited. Still, very little is presently known about how these structures are formed, and the focus of the proposal is on the application of a plethora of experimental and theoretical tools to understand the fundamentals of the process.

If a set of conditions for formation of a certain structure by the freezing process is discovered the research could truly be regarded as ground breaking. As regards the organization of the proposed activity one is less certain, since so many disparate part-projects are lined up, from the formation of a structure with strong mechanical properties to construction of a VOC capturing device to improve indoor climate.

Potential impact:

Yes, the research proposal opens many doors to new and important applied and fundamental studies. If successful in just a few of the proposed research themes, the project would be a tremendous success. The PI does not indicate that the CNRS is particularly interested in the project, and this might be a difficulty in the spreading of the results

High-gain/High-risk balance:

The project can well be considered a high risk venture since a number of virtually unknown physical phenomena are to be investigated.

Publication of successful results in high profile journals can also be envisaged.

Methodology:

The research proposal is very well written with respect to demonstrating the potential of the research field. When it comes to description of the actual research to be carried out the proposal tries to cover so many part projects that one may have certain doubts as to the feasibility, especially since the PI has only little experience with handling a research group as large as the proposed (6 post-docs and 2 PhD students).

One might well expect that new materials are discovered that have considerable practical use, and the theoretical part of the project could also lead to new insight into a field that has not yet been well researched. The risk of a break-down is, however, not to be disregarded.

3. Research environment:

Contribution of the research environment to the project:

It is not entirely clear to which extent the CNSR is genuinely interested in the project and the PI is not particularly informative as to the degree of overlap between his current work at the CNSR and the project.