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Research Statement

My initial main goal, will be the growth of the academic programs; since, the further development of program could support the nation's commitment to achieving a broad-based research and technological capability in, materials for energy and environmental applications.

To carry out my goals is necessary the creation of excellent multidisciplinary research teams, in order to try to be world leaders in some Research fields, developing the scientific foundations of technologies to be applied in the new economy that after a profound crisis must be coming up now. These goals must be obtained under the rule of values such as: ethics, team work, scientific rigor, applicability of the obtained results, truth over all, concreteness, originality, communication, consensus, respect and if it is possible even friendship. This mean that the academic and research effort that is going on now in the department will be as well extended. To be precise, I would like to harmonize, complement and synchronize the research topics currently going on in the School with my previous work in the development of experimental and theoretical methods for the study of materials for sustainable energy applications, pollution abatement and sensors giving only the right weight to my personal effort.

The philosophy behind my personal research proposal is the fact that a very important group of materials is not normally studied as a whole: these materials are: ion conductors, porous and dense permeable materials, adsorbents, ion exchangers and catalyst. Examples of these of materials are: coordination polymers (metal organic frameworks, Prussian blue analogs and nitroprussides), perovskites, zeolites and related materials, mesoporous molecular sieves, silica, active carbons, carbon nanotubes, photo catalysts and other materials. These materials have many energy and environmental applications. I have been active during my career in the study of: diffusion, ion conduction, permeation, adsorption, ionic exchange, catalysis, and the development of instruments and sensors to carry out the characterization of these materials.

For the advancement of the excellence in research and teaching, from the personal point of view, the key factors that should be considered in my opinion are: continuous self-development by an intense participation in research projects, self-study, attendance to scientific congresses, participation in periodical seminars, collaboration with prominent colleagues and the obtainment of external funds. From the student point of view encouraging the participation of students in research projects and developing programs to get funds for student scholarships are some of my objectives as student research supervisor.

In research supervision I have a large experience. This practice indicates that real Science should be carried out by research groups. The center of the group is the leader that must be genuine, no designed, because he must be the generator of original ideas. This is the key person in the group. Besides, these leaders are very difficult to find. This leader should have a collective of senior collaborators that indisputably accept his leadership and a collective of graduate and

undergraduate students. The interaction of the director with all these researchers (leaders and collaborators) must be of full respect. That is, the director should try to get always or in the great majority of cases consensus. In Science you cannot impose; since, we are dealing with very intelligent and educated people; that is, with peers.

Enrollment is very important, hence to get students enrolled in Science it is necessary to be in close contact with reality to provide the student an education that could help in the development of his future. In this regard the development of undergraduate research programs, new graduate programs, mentorship, internships in productive enterprises, participation in group seminars, conferences delivered by great scientists and the participation in congresses between other issues could help in this endeavor. On the other hand, the interaction of the chair with the faculty must be of complete deference. It is necessary the creation of a search committees for any open position, openly discuss how the budget is expended, how are allocated the materials resources, committees for the creation of new programs. To be more precise the department chair should get consensus in the important issues. Since, in teaching you can't, as well, impose your opinion; since, you are treating with peers.

My supervision philosophy with students is very demanding. For graduate and undergraduate students, a very clear statement of the danger involved in the concrete research process is made at first. Later, the student is trained in how to avoid it. Also, what is the scientific method and how to apply it, is also explained. Then, the research methodologies involved in the study of the concrete topic of investigation are described. Besides, a wide bibliographic study of the concrete thematic of study is made and the student is informed in how to get scientific information. In addition, the student is trained in the art of getting knowledge from experiments and how to redact a scientific communication to inform the scientific community about these findings.

I propose to continue my work in the study and use of nanostructured material; such as, silica, active carbon, metallic nanoparticles, semiconductor nanoparticles and others and low dimension nonporous crystalline materials; such as, metal organic frameworks, metal organic phosphonates, covalent organic frameworks, nitroprussides, Prussian blue analogues, akaganeites, zeolites and perovskites; all of them to be used in energy and environmental applications. The philosophy behind this proposal is the fact that ion conductors, porous and dense permeable materials, adsorbents, ion exchangers and catalyst are not normally studied as a whole and have many energy and environmental applications. In this direction I will lead a research group in Materials Physics with an international visibility that will give the students the opportunity to work in first class research on the field.

Another principle of my approach is to complement the current research projects and collaborate with other research groups. Hence, I will create a productive, interdisciplinary, motivated and unified research team and generate strong internal communication and collaboration between the team members. My work is essentially interdisciplinary in nature. Hence, if hired, I will be a permanent facilitator to promote interdisciplinary projects between the different research groups inside and outside the department.

In addition, I will establish a high rate of proposal submissions and publications, set up concrete and achievable research goals, have a dynamic attitude toward changes, make an effective use of the economic, politic and scientific information to get funding support from different sources.

For the advancement of the excellence in research I will create using external funding the conditions for the continuous development of myself and my group promoting the attendance to

congresses, seminars and other meetings, and the obtainment of external funds. Besides, my interaction with Faculty will be with complete deference. I will openly discuss, how my budget is expended, how are allocated the materials resources, the creation of new programs, space, and other issues.

From the student point of view, we must encourage their participation in research or other projects develop programs to get funds for scholarships, increase the academic offer, create locations for mentorship, provides opportunities to get internship in creative enterprises, participation in group seminars and conferences delivered by highly qualified scientists and the participation in student congresses. I will be a permanent advocate of the importance of the undergraduate research. Since it will be a commensurable source of motivation for our students.

For the advancement of the excellence in teaching, from the personal point of view, the key factors that should be considered in my opinion are: continuous self-development by an intense participation in research projects, self-study, attendance to scientific congresses, participation in periodical seminars, collaboration with prominent colleagues and the increase of the release time by the obtainment of external funds. From the student point of view, develop the skills in problem solving and abstract reasoning, by: tutoring, mentoring, and academic counseling is my goal as instructor. Additionally, encouraging the participation of students in my research projects and developing programs to get funds for student scholarships is my objective as research supervisor.

During the last forty years, I have been teaching, graduate and postgraduate courses on: Modern Physics, Materials Science, Statistical Physics, Physical Chemistry, Instrumental Methods of Materials Analysis and Mathematical Methods for Physicists. Besides, during the last 30 years, I have been full professor.

In the research supervision of undergraduate and graduate students, I have also a large experience. To be precise, more than 100 undergraduate students, 6 Post-doctoral associates, 52 graduate students, 21 Ph.D. Thesis and 11 MS Thesis, have been supervised by me. My supervision philosophy depends on the level of the student, but is always very demanding. A very clear statement of the danger involved in the research process is made at first. Later, the student is trained in how to avoid it. Also, what is the scientific method and how to apply it, is also explained. Then, the research methodologies involved in the study of the concrete topic of investigation are described. Besides, a wide bibliographic study of the concrete thematic of study, is made and the student is informed in how to get scientific information. In addition, the student is trained in the art of getting knowledge from experiments and how to redact a scientific communication to inform the scientific community about these findings.