

Spanish and Argentinean researchers study biological membranes

Dr. Ing. Ana Korol is a full time professor and researcher at the Latin America National University of Rosario in Argentina. At the beginning of 2008, Ana was accepted as Latin America visiting researcher in the NANOFORUMEULA project. During one month and a half (18 August to 29 September), she has been in Madrid, Spain. She was located at UAM at Material Science Institute: “Nicolas Cabrera”.

What have you worked on during your visit?

During my visit I worked with Dr. Marisela Velez, and became familiar with advanced instruments like the quartz crystal microbalance (QCM), the atomic force microscope (AFM) and quantitative fluorescence microscopy (sFCS). These are useful techniques to study biological membranes. We explored the use of mathematical statistical properties to analyze the energy dissipation data obtained with the QCM analysis of bilayers formed from Escherichia coli (bacteria) and lipids.

Why is that important for your research and for progress in nanotechnology?

Working with sFCS and QCM was a great possibility for me to take advantage of resources at highest level at UAM, which I do not have in my home country. I have improved my knowledge in optical devices which could help on the understanding of different bilayers of lipids and proteins on biological membranes. I have been working previously in my home country with red blood cell membranes, and the used of the nonlinear parameters would distinguish between healthy, and disease samples and also could be used as marks on treatment of the diseases. I have been publishing the results since 1999. Now at UAM, we would like to be able to distinguish diferent bilayers formed from Escherichia coli and lipids.

Why did you come to this European research centre to do this Project?

The Nicolas Cabrera Material Science Institute at UAM in Madrid has the tradition of international scientific excellence judged by the quantity and quality of their scientific publications. And I also liked very much the research line of Dr. Marisela Velez, which takes advantage of quartz crystal microbalance for studying biological process that take place on surfaces.

What are the results? How will you disseminate them?

My visit to Madrid in the NANOFORUMEULA project, despite being very short, is very promising. On the one hand Dr. Velez is really interested in obtaining information of time series from diffusion coefficient on the bacteria EcoliPolar. They could not find this

otherwise. On the other hand, for a Latin American researcher there is a possibility of being trained with new technologies.

During the first two weeks of my visit I had the opportunity of becoming familiar with the scanning Fluorescence Correlation Spectroscopy (sFCS). This is a novel technique that I had never used before. Unfortunately technical problems prevented us from using the sFCS to study the interactions between the polycations polymer and red cell membranes. I hope this will take place in a future collaboration.

At the same time, I studied the quartz crystal microbalance (QCM), which comprises a thin quartz crystal between two metal electrodes that establishes an alternating electric field across the crystal, causing vibration of the crystal at its resonant frequency. This process is sensitive to changes in the mass of the studied object. I have to say this technique was also absolutely different from the ones I have used before. They are excellent tools to work with, at nanometre scale.

At the Nicolas Cabrera Institute, I used the QCM, for analyzing liposome fusion of lipid vesicles of E.coli lipid extract. The time series of the energy dissipation of the signal measured during the process could provide information about the membrane interaction with the surface and its mechanical stability. This enriches the information obtained from the standard analysis.

Chaotic systems like the studied interaction of the membrane with the surface are similar to stochastic processes. I have applied stochastic methods to obtain relevant information which could not be obtained otherwise. This was exhaustively discussed in Spain, and the calculations will be completed in Argentina. Despite the very short visit we hope the results will be important and could be published as part of this NANOFORUM EULA project.

Is this the first contact between both organizations or is your visit part of existing collaborations?

I would be surprised if my participation would be the first between both institutions, but I do not know about previous collaborations. This is the first stage of what we hope to be a long collaboration between our organizations.

What are the plans for future collaborations?

We would like to explore the possibility of academic and scientific collaboration by promoting the exchange of researchers also fellow and graduate students. I am a full time professor at Biochemistry College. We are starting a Bioinformatics Specialization in September 2009, and we would like to receive students or researchers from Madrid to work with. On the other hand, we could benefit if our researchers and graduate students are trained at Nicolas Cabrera Institute at UAM in Spain.

Do you intend to apply for funding in the EU 7th Framework Program for RTD?

Yes, we are a research institute (IFIR-CONICET), at Argentina with a long tradition, looking for funding in our areas of expertise which are of paramount importance. We believe that we have the background and enough experience at high-level, in order to be able to perform scientific research and development in Nanotechnology and Biotechnology.

How may your project in the long term benefit the development of your country or Latin America in general?

I have been looking for a way of inserting nanotechnology and biotechnology in the development pattern in my country. The recently created State Secretary of Science and Technology, offers a very good promise. This collaboration with UAM is a first important stage for this purpose and a model to be followed.

A further benefit is the integration of partnerships with European research institutes, in the transfers of knowledge in both directions. Given Argentina's situation, with an entirely scientific conceptualization of nanotechnological and biotechnological development, but a total absence of new and expensive devices, there is a need to be trained in the ability of using those techniques and also to improve the theoretical background.

What are your plans for disseminating the results of your visit outside the research community in your country?

The Physics Institute of Rosario (IFIR), as well as Biochemistry and Biotechnology College, are committed to provide opportunities for presentations to all audiences for the widest possible dispersion of the research: all national universities, industries, other institutes, and public in general. Through the website, we have the possibility of reaching researchers continent wide to ensure diffusion and also discussions of expert researchers in different Latin America and European countries.

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