ROMEO

REACTOR OPTIMISATION BY MEMBRANE ENHANCED OPERATION

European Research & Innovation Project

Reactor Optimisation by Membrane Enhanced Operation

Interview with Miguel A. Bañares

Full Research Professor at CSIC in Madrid

> " ROMEO's idea to immobilize ionic liquid in a porous frame, to control the distribution of this ionic liquid into it and to be able to get control on selectivity is amazing! "

Hi, Miguel ! Can you please tell us a little bit about yourself ?

I have always been very fond of science. Exploring is something I like. I got my degree in chemistry and then started my research career in the field of heterogeneous catalysis.

I guess I was lucky because during my PhD I had the opportunity to start using in situ Raman spectroscopy during a stay at Lehigh University. That was very informative because I got a lot of insight into what makes a catalyst active and I realized that I liked characterization, but also that getting close to the reactivity was important.

Then I went for a PostDoc in Indiana at Notre Dame University, where we were playing with infrared spectroscopy. We were looking at the structural changes of many catalysts, observing at the same time how the systems were becoming increasingly active.

When I went back to Madrid, in 1995, I got my position of scientist at the Institute for Catalysis of the Spanish National Research Council (CSIC). In 2000 I promoted to senior scientist, and in 2008 to research professor.

What is your favorite work subject ?

All my activities have always been about making emphasis on characterizing catalysts, catalytic systems and even catalytic reactions, mainly with Raman spectroscopy and a lot of cooperation! My research activities have typically been focusing on understanding the relationship between their structure and their performance.The problem is that you have to do characterization during the chemical act.

That is what I called the "Operando" methodology, because separately they don't really connect. Actually, it is quite a simple idea, but few people had been doing it.

Date of interview : May 2017
Publication : August 2017

We have started to investigate using the operando methodology in 2000 with few other groups in Europe.

The idea is not only treating samples in different environments but also looking at the structure of the real working material, measuring its activity simultaneously. That's what makes the difference, trying to get into the real things. I have always been moving in that direction.

> **" That's what makes the difference, trying to get into the real things. "**

What does your daily job look like?

Paperwork, travelling, paperwork, travelling and… paperwork. More seriously, daily experimental operando work is distracting and very demanding because making real time characterization means that you must have spectrometers, online activity measurements and catalytic reactors working correctly, and simultaneously. Hopefully, if you like it you don't complain!

I enjoy managing people working on these experimentations and also doing a lot of collaborative work. The operando methodology is becoming popular and often nice and challenging collaborations arise. For example, right now, we have 4 visitors in our relatively small group who come from Hong-Kong, Italy, Brazil and Argentina to do operando Raman studies. It is very exciting because each group poses a different scientific and/or technical challenge.

We are dealing with really diverse kinds of reactions, so, I learn a lot!

> **" I enjoy managing people working on *operando* experimentations and also doing a lot of collaborative work. "**

We heard that you have been awarded doctor honoris causa of University of Caen Normandy (UNICAEN). Congratulations! Can you please tell us a little bit more about it? How do feel regarding this award?

I see it as a way of recognizing my contribution to the implementation of the operando methodology, and subsequently the importance of the methodology itself.

I know they are giving this recognition only every ten years, so I am overwhelmed. Although I'm not the only one, we are 6 awardees from 6 different fields of knowledge; it makes me feel a high responsibility! There has been a really tough selection so I feel really obliged. I really have to keep up my work to be at the level this distinction implies.

> **" Now we have managed to obtain pretty straight tubes of the composition and shape desired, which was quite a challenge! "**

What excites you in ROMEO?

The frame of ROMEO is challenging, with the objective of optimizing the reactions performance applying constraints to the transport of some components. The idea to immobilize ionic liquid in a porous frame, to control the distribution of this ionic liquid into it and to be able to get control on selectivity is amazing!

Our contribution in CSIC is basically about making the membranes structure.

It could be interesting in the future to say ok, now that we have the system working and we can compare several systems, we can get real time profiles to know what is happening with the membranes and with the molecules absorbed by the membranes. But before running, you have to walk. We are now making a system that will work. It would be really interesting to tackle this in the future, but it is not in the program of ROMEO.

Date of interview : May 2017
Publication : August 2017

What are, according to you, the major challenges to be overcome in ROMEO?

Our group should be able to get a good control on the actual shape and mechanical resistance of the membrane. Now we have managed to obtain pretty straight tubes of the composition and shape desired, which was quite a challenge! We are able to engineer them accurately. To my opinion, the great challenge that we have is to get the opportunity to control the acidity and the porosity of this material.

Thanks for your time Miguel, and all the best for your projects!

“ It could be interesting in the future to say ok, now that we have the system working and we can compare several systems, we can get real time profiles to know what is happening with the membranes and with the molecules absorbed by the membranes. But before running, you have to walk. ”

The Institute of Catalysis and Petrochemistry is a research center belonging to the Spanish Council for Scientific Research (CSIC), an agency under the Ministry of Economy and Competitiveness (MINECO), and is framed within the Area of Chemistry and Chemical Technology, one of eight scientific-technical areas in which the CSIC divides its research activities.
www.icp.csic.es/

Date of interview : May 2017
Publication : August 2017

ROMEO in brief

Funded by European Commission (Horizon 2020)

Start date:
14 September 2015

End date:
13 September 2019

Budget:
6 Million €

Contacts:
Evonik - DE
Project Coordinator - Prof. Robert Franke
Scientific Coordinator - Dr. Frank Stenger
Project Manager - Dr. Marc Oliver Kristen

ROMEO
REACTOR OPTIMISATION BY MEMBRANE ENHANCED OPERATION

H2020-EU.2.1.5
Project Reference: 680395