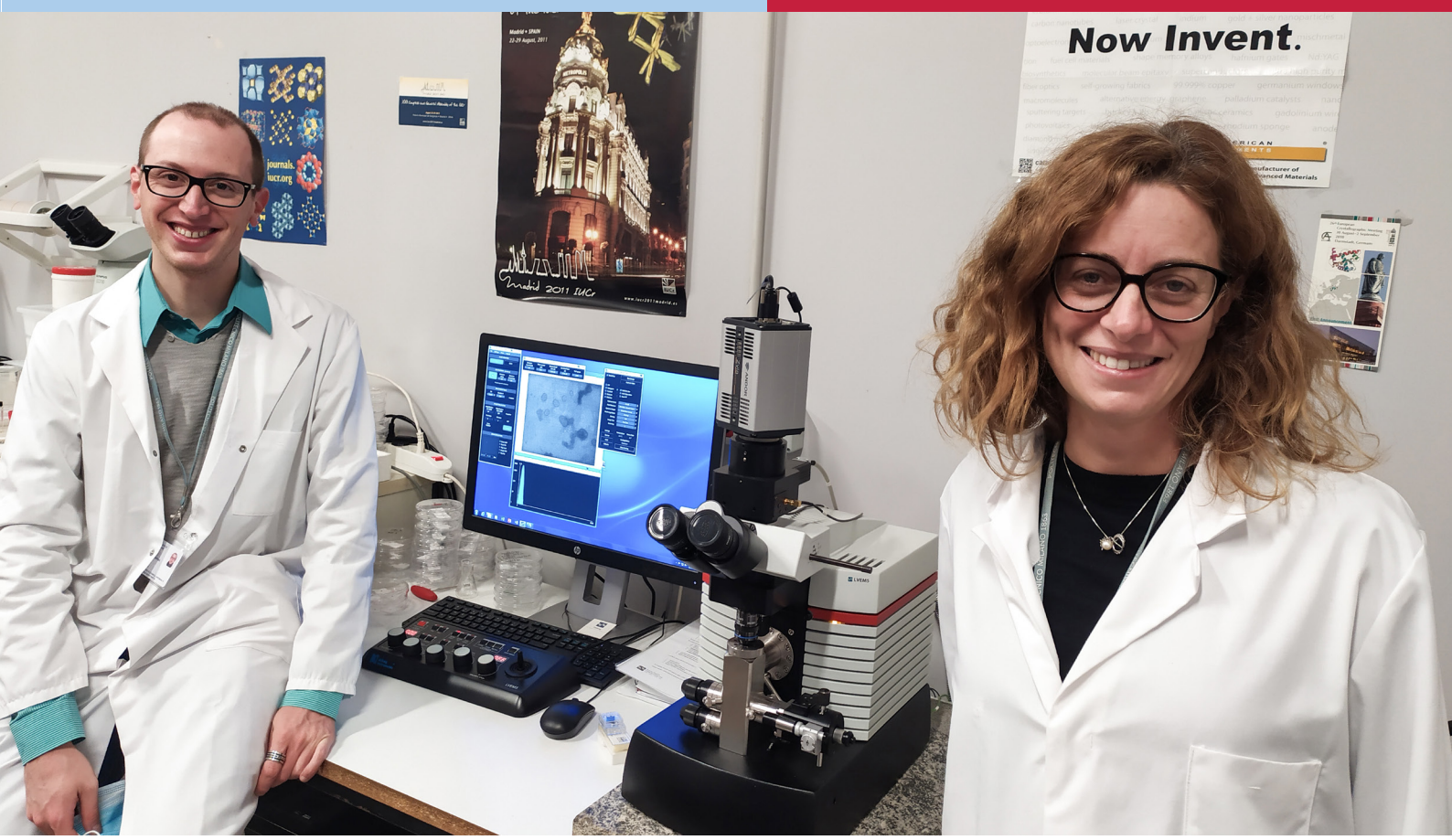


LVEM 5 User Profile: Dr. Francesca Baldelli Bombelli

We recently talked with **Dr. Francesca Baldelli Bombelli**, Associate Professor in Chemistry at the Politecnico di Milano. After receiving her PhD in Chemical Sciences in 2004 from the University of Florence, she held Post-Doc researcher positions at CBNI, University College of Dublin (2009-2011), the University of Florence (2006-2009); and Chalmers University (2004-2006). More recently, she has been Group Leader at the European Centre of Nanomedicine (2013-2015) and lecturer of Nanotechnology and Colloid Science at the School of Pharmacy, University of East Anglia, Norwich, UK. (2011-2014).

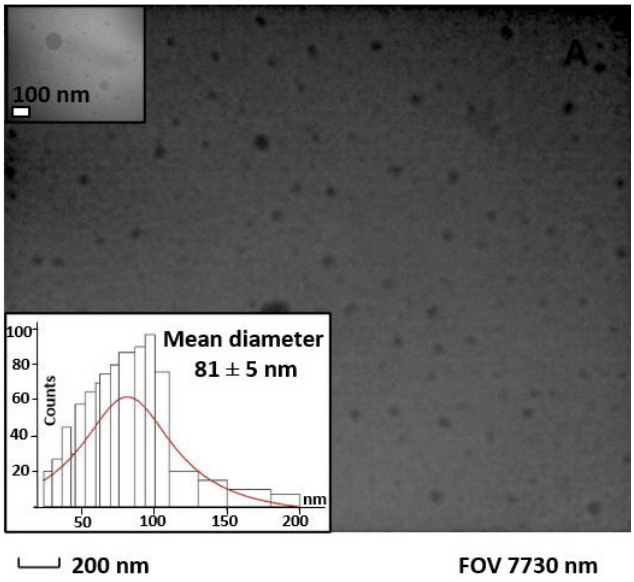
The research interests of Dr. F. Baldelli Bombelli are focused on the development of engineered nanomaterials (ENM) for the diagnosis and treatment of untreatable diseases such as cancer and neurodegenerative pathologies. In particular, she has recently developed drug delivery systems and fluorinated nanomaterials that showed promising feature to be used as 19F-MRI contrast agents. Moreover, her research also aims at investigating the interactions between ENM and the cellular machinery to improve their efficiency in vivo and evaluate possible toxicity effects. Particularly, her work has been dedicated to the study of the protein corona complexes formed by nanomaterials in situ in relevant biological fluids.

Dr. Bombelli has been a user of the Delong Instruments LVEM5 for a few years, and has published work supported by the LVEM5. One recent publication explores how fluorination of polymer nanomaterials could enhance drug encapsulation, and the LVEM5 helped to confirm that the morphology of the new nanomaterial is within acceptable tolerances. The following interview has been edited for brevity and clarity.

Hi, Dr. Bombelli. I'm excited to learn more about you, your research, and how you've used the LVEM5. To start, can you please tell our readers a little bit about yourself?

I am a chemist working in the field of soft matter with particular interest in the development of novel nanomaterials with applications in medicine. I am interested in the development of nanoformulations for specific applications, such as cell labelling, gene delivery, drug delivery etc.

F_3-PLGA NPs



F_9-PLGA NPs

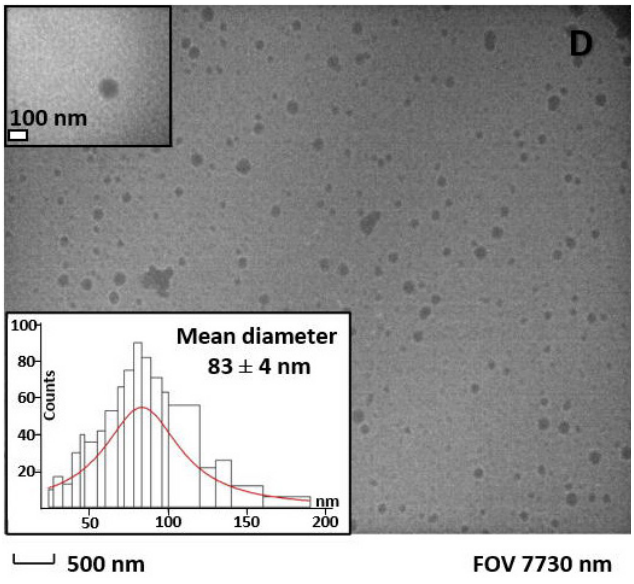


Figure of LVEM5 images, adapted from "Fluorinated PLGA Nanoparticles for Enhanced Drug Encapsulation and 19F NMR Detection." Chemistry – A European Journal, Volume: 26, Issue: 44, Pages: 10057–10063, First published: 09 June 2020, DOI: (10.1002/chem.202002078).

In recent years, I have been focused on the development of fluorinated nanoformulations working as 19F-MRI probes. I am also interested in studying the interaction of these nanoparticles (NPs) with the cellular machinery and more generally the biological environment.

Why did you choose to purchase a LVEM5?

Because we wanted to have a benchtop electron microscope that is easy to use, without the need of a specific technician to run it, and with a low cost of maintenance.

What are your favorite things about the instrument, now that you've owned it for some time?

It's easy to use and allows the screening of a high number of samples in a quite short time. It is also quite good in the imaging of organic nanomaterials thanks to its low voltage which does not degrade them.

You very recently published a paper titled "Fluorinated PLGA Nanoparticles for Enhanced Drug Encapsulation and 19F NMR Detection." (Neri, 2020). Can you briefly describe that work, and how did the LVEM5 help you in your research?

This work has produced novel fluorinated biocompatible polymers which can be formulated as NPs in the aqueous environment, able to encapsulate hydrophobic drugs in high amounts and deliver them intracellularly. These NPs are also active in 19F-NMR with a strong single signal that can be applied to track them in vivo by 19F-MRI.

What are other ways you utilize the LVEM5 in your research?

The LVEM5 in my lab is mainly used in the TEM modality to visualize and screen the morphology of nanoparticles, and self-assembled nanomaterials such as peptide fibrils.

Where did you decide to place the instrument, presumably in your lab (as opposed to a core facility in a dedicated room)?

We placed the Instrument in a lab with other instruments (a no chemical lab) for the characterization of materials.

How hard was site prep?

Quite easy.

That certainly is a strong endorsement! Especially given how complex other instrument installations I've overseen have been.

How many users in your group are trained on the LVEM5?

About 3 people, but the training is quite easy and we could even have a higher number of people using it.

Is this a shared resource for other researchers at your institution?

Yes, each group has 2 trained people.

What is something you would like to say to someone considering purchasing an LVEM5?

We are very satisfied with the instrument as it allows us to screen a high number of samples in a short time with a limited cost. Obviously, for high resolution images sometimes we need to run some sample also by a conventional high-resolution microscope. Another limitation is related to quite thick films that with this voltage are not measurable but for example organic NPs have been clearly imaged without the use of staining.

That is wonderful advice! Thank you, Dr. Bombelli, for taking the time to share your stories about your exciting research and how the LVEM5 is a powerful enabling tool.

References:

Neri G, Mion G, Pizzi A, Celentano W, Chaabane L, Chierotti M, Gobetto R, Li M, Messa P, De Campo F, Cellesi F, Metrangolo P, Baldelli Bombelli F. Fluorinated-PLGA Nanoparticles for Enhanced Drug Encapsulation and 19F-NMR Detection. Chemistry (Weinheim an der Bergstrasse, Germany). 2020 Jun 9.

About the author:

Robert I. MacCuspie, Ph.D., has over twenty years of experience in nanotechnology and materials characterization. Career highlights include leading the team that developed the silver nanoparticle reference materials at the National Institute of Standards and Technology, the first faculty and Director of Nanotechnology and Multifunctional Materials Program at Florida Polytechnic University, and over five years of consulting at the business-science interface from MacCuspie Innovations, helping companies commercialize and educate on technologies to improve human health.