Newsletter 4 (PCIG N4) - 26.04.2024

Welcome to the fourth edition of our newsletter!

PREFACE

This newsletter aims to serve as a means of internal communication of useful information and strengthen engagement among the group members. This quarter's newsletter with the first edition (January – April 2024) consists of three main sections:

A. Research highlights, which represents the emerging technologies in particle characterisation.

B. People focus, which reveals the motivation and sharing from different researcher members.

C. Update corner, which summarises the new events, collaboration, and other opportunities.

The team responsible for the current edition includes **Mel Disher, Merel Bout, Phil Jackson, Sayantan Das, Stefanos Mourdikoudis**, **Tien Thuy Quach, and Yenugu Veeramanohara Reddy**. We recognise and appreciate **the PCIG Committee** for the encouragement and advice provided to us during the preparation of this edition. Many thanks for the contribution from the people who are willing to co-operate with us. We look forward to your collaboration in the subsequent editions!

Welcome to the PCIG Newsletter,

where we network and work together for better particle technologies.

A. RESEARCH HIGHLIGHTS

Single-particle thermometry - Review of a relevant research work

Written by Stefanos Mourdikoudis

Precise determination of the temperature of metallic nanoparticles under illumination is challenging, hindering the safe interpretation of results in several plasmonic applications. The complexity of heat transport at surface faces and interfaces of bimetallic particles makes their photothermal modelling particularly cumbersome. In fact, the role of temperature in plasmon-mediated catalysis needs to be better understood. Bimetallic nanoparticles which combine plasmonic and catalytic properties draw attention to artificial photosynthesis and the production of solar fuels.

In this context, Emiliano Cortes and co-workers presented recently that they have successfully carried out single-particle thermometry measurements to study the relation between particle shape and light-to-heat conversion of colloidal Au/Pd nanoparticles (NPs) with two distinct morphologies: core-shell and core-satellite [1]. The technique employed was hyperspectral anti-stokes (AS) thermometry. With this technique, upon illumination with a continuous wave (CW) laser, the AS part of the photoluminescence spectrum of plasmonic particles exhibits a temperature dependence. The authors showed that the inclusion of palladium as a shell strongly decreased the photothermal response compared to the bare cores, while the utilisation of palladium as satellites retained the photothermal properties almost unchanged.

These researchers first developed Au@Pd core-shell NPs with varying shell thicknesses and they examined the alterations in their on-resonance photothermal response, as a result of the increase of the particle temperature under illumination. The light absorption efficiency was larger when the Pd was presented in the form of satellites onto the Au cores, rather than being present as a shell on the gold surface. Both of the above-mentioned configurations, that is, core-shell and core-satellite, had their photothermal coefficients measured as explained in Figure 1. The obtained results help to better understand the role of bimetallic interfaces in photothermal heat generation, which is required to improve the photon-phonon conversion processes of plasmonic-catalytic hybrids. In Figure 2, an illustration of the hyperspectral AS thermometry is explained.

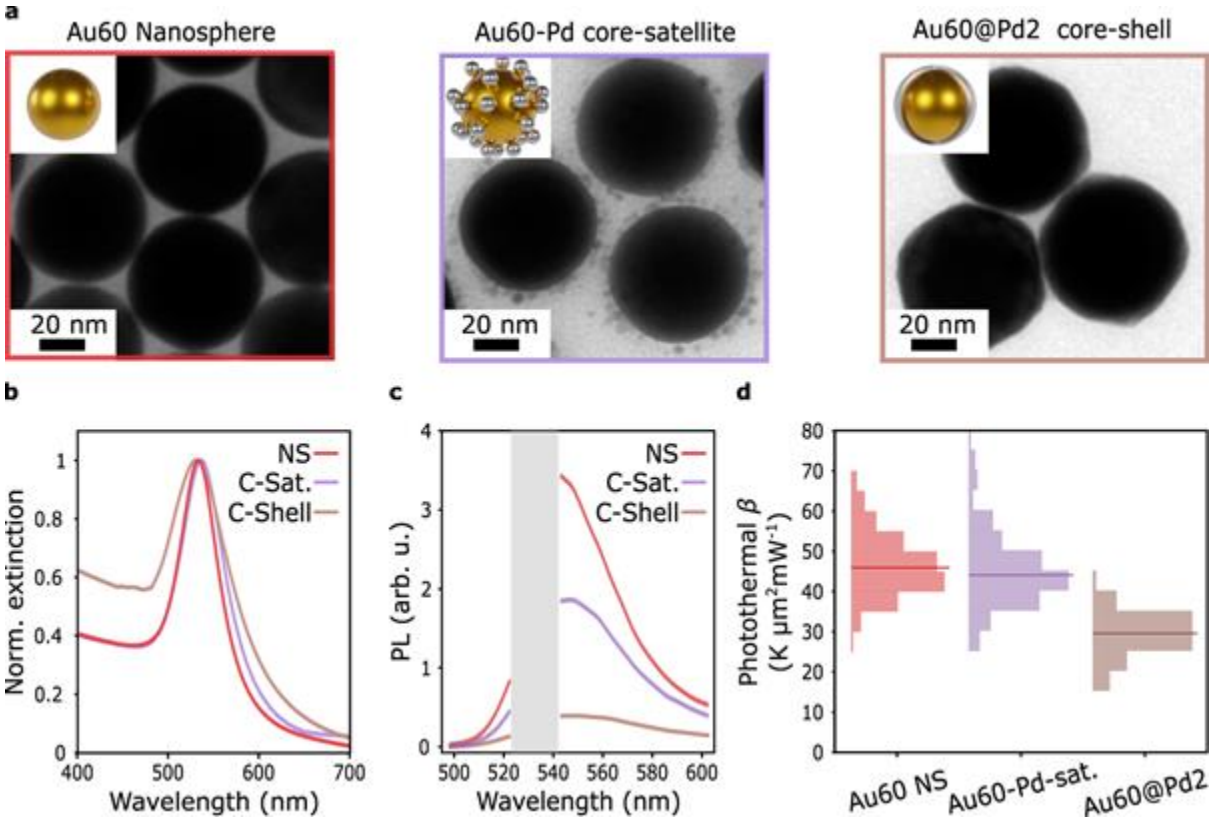

Figure 1. **a** Illustration and TEM images of the synthesised NPs. **b** Experimental extinction spectra. Each spectrum is normalised using its own maximum. **c** Average of single-particle PL emission spectra of NPs on glass substrates and immersed in water, excited with 1 mW μm^{-2} of laser light at 532 nm. A grey band with no data corresponds to the laser rejection filter. **d** Histograms of the experimental measured photothermal coefficient β for the three systems on glass substrates and immersed in water, at 532 nm. Red, violet, and brown correspond to Au60 NS, Au60-Pd-sat, and Au60@Pd2, respectively.

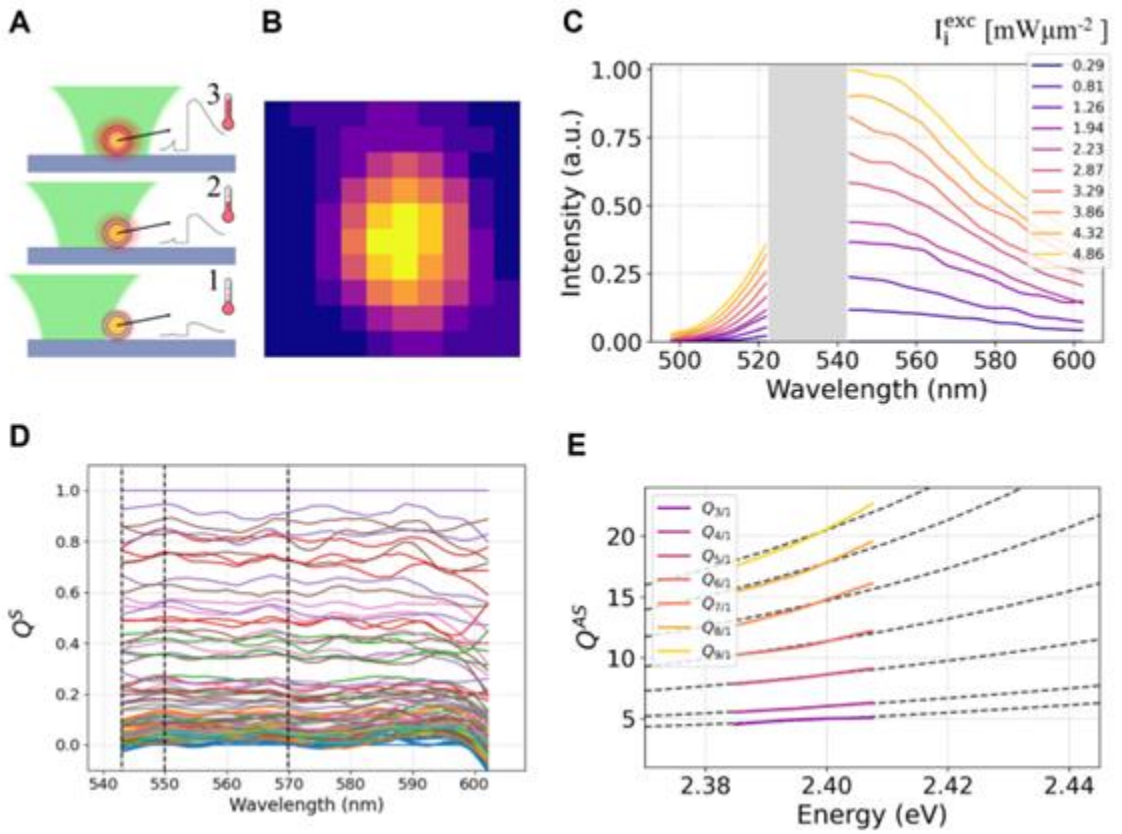

Figure 2. Hyperspectral thermometry. A) Illustration of the method for hyperspectral AS thermometry. Heating and PL excitation are performed simultaneously with the same beam. The laser is raster scanned, changing the relative position between the NP and the beam. For each relative position (exemplified with numbers 1,2,3), the excitation irradiance seen by the NP is different, and hence, it reaches a different temperature. At each position, a PL spectrum is acquired. B) Hyperspectral PL emission image, binned according to the excitation irradiance. C) Average PL emission spectra of each bin. The estimated excitation irradiance is indicated in the label. D) Example of ratios between PL Stokes spectra used to calculate $Q^S_{i,j}$. E) Ratio between PL AS Stokes spectra. Experimental data are the colored solid lines, while dashed black lines indicate the fits with $Q^{AS}_{i,j}$ (λ).

As a conclusion, the authors of that work note that the use of Pd influenced the photothermal coefficient of Au NPs mainly by modifying their absorption cross-section because of plasmon damping. The main feature controlling the damping is the existence of an interface between the different elements, with a minor effect on the total quantity of the inserted Pd. The significance of interface tailoring for light-to-heat conversion was highlighted. Photothermal characterisation at the single-particle level allows a better comprehension of the correlation between the particle structure and the produced heat. Even though two systems can contain the same materials (in composition and amounts), the resulting photothermal properties can

vary, depending on the spatial distribution of the components. The authors note that quite often, higher temperatures are favourable for catalytic reactions, despite other non-thermal mechanisms which occur at the same time. AS thermometry provides label-free, non-invasive and in-situ information at the single-particle range, and it can be utilized in liquid or gas phase reaction environments. It can also be combined with other techniques to achieve a complementary and more spherical view on the role of shape and composition in the reactivity of nanoscale particles.

Reference

[1] Gargiulo, J et al. Impact of bimetallic interface design on heat generation in plasmonic Au/Pd nanostructures studied by single-particle thermometry. Nature Communications (14), 2023: 3813. Available at: https://www.nature.com/articles/s41467-023-38982-9

A guide to electron microscopy

Written by Merel Bout

In the realm of particle characterisation techniques, one powerful technique is electron microscopy (EM). EM is a widely used technique for powder characterization due to its high resolution and imaging capabilities. Electron microscopy (EM) can be used to visualise objects at nanoscale [1] and therefore allows for the visualisation of powders at a very high resolution. This visualisation provides detailed information on the particle size, shape, and surface area. One well known example of EM is the image of a sandworm that looks like it's laughing (Figure 1A) and many similar images have been used to create 'memes' (Figure 1B). Electron microscopical images often seem as if they stem from a different world because most of the structures or micro-organisms made visible through the use of EM and display things we have never seen before.

Figure 1A. Nano-image of a sandworm. 1B. Nano-image of a deep-sea worm [2]

The basic set-up of EM still resembles a 'normal' microscope, as seen in Figure 2. However, what makes an electron microscope unique is that the traditional light source is replaced by an electron beam. Electrons can exhibit a wave-particle duality in vacuo so they can mimic the behaviour of photons found in light. The electron beam interacts with the atoms of the sample which produces contrast. However, as electrons possess a smaller wavelength than visible light, our eyes cannot perceive electrons. Instead, we need specialised electron imaging lenses to convert the electron signal into a grayscale image. These lenses generate

magnetic and electric fields to guide and focus the electron beam. In the resulting image, contrast reflects differences in sample thickness and density. This makes the image not only very detailed but can also create a 3D-like image [1,3].

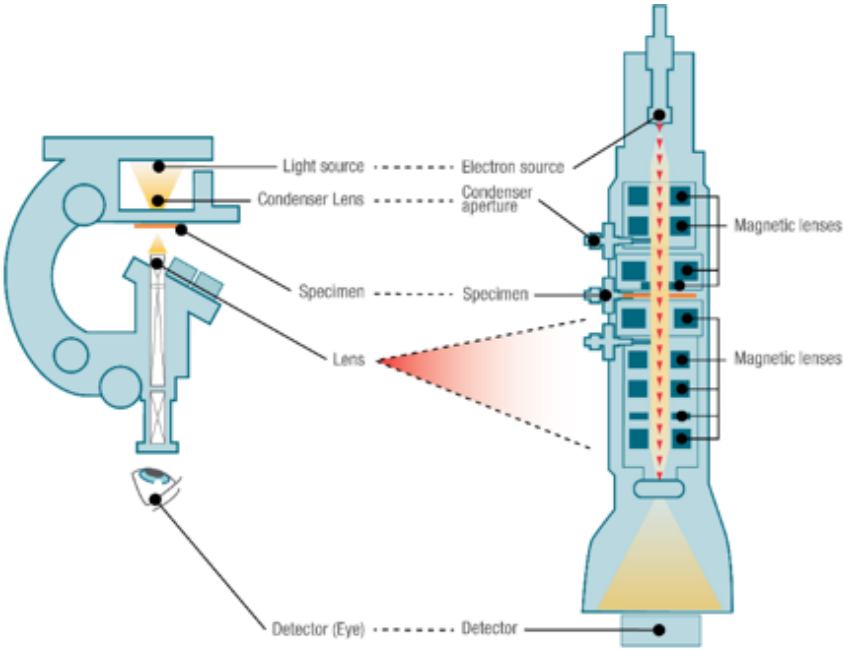

Figure 2. Difference in set up of a light microscope (left) and TEM (right) [3]

The two main categories of EM are transmission electron microscopy (TEM) and scanning electron microscopy (SEM). The main difference between SEM and TEM is that SEM creates an image by detecting reflected or emitted electrons, while TEM uses transmitted electrons, i.e. electrons that are passing through the sample to create an image. Simply put, SEM can see the surface of the particles and TEM can see through the particles (Figure 3) [1,3].

Using both SEM and TEM, detailed information about the sample's internal structure including crystalline arrangement and surface morphology such as texture can be collected.

SEM images primarily show surface features of the specimen, such as texture, morphology, and elemental composition. It provides high-resolution images of the specimen's surface topography. Additionally, energy-dispersive X-ray spectroscopy (EDS) can be used to analyse elemental composition, further enhancing the analytical capabilities of SEM. As the electrons interact with the sample's atoms, they become ionised and emit a photon to reach a ground state. The emitted energies can be determined to what electron transition occurred and thus what element it corresponds to [4].

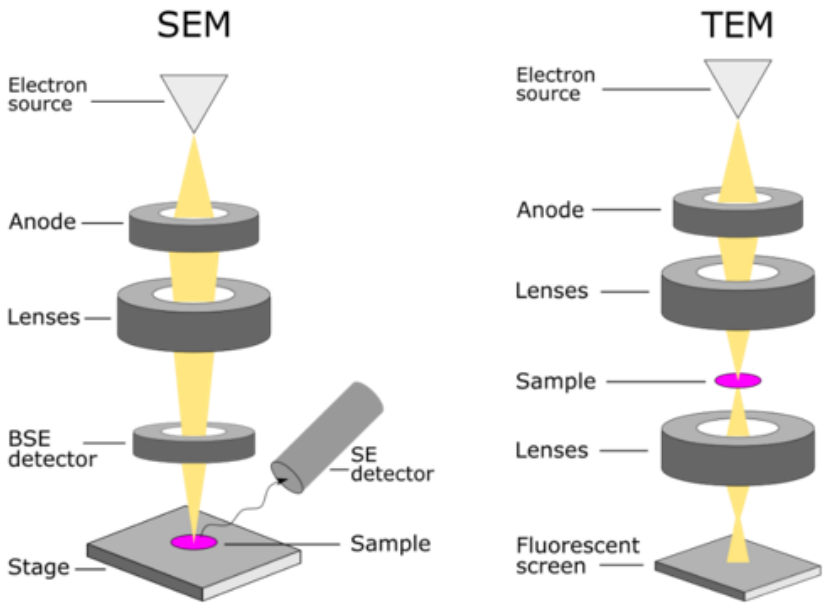

Figure 3. Set up of a SEM and TEM. Source: AnaPath. Electron Microscopy.

Another feature that has made continuous advancements is cryo-EM (cryogenic electron microscopy). In 2017, a Nobel Prize in Chemistry was awarded to the scientists involved in the development of Cryo-EM. The development involved a new solution for holding small molecules in place. This made imaging possible for small molecules, whereas before we could only see the atomic structure of large proteins (Figure 4). Cryo-EM requires the use of both an electron beam and dynamic vacuum conditions, to get the best electron beam properties. Cryo-SEM works at cryogenic temperatures (typically below -150 °C) which helps with visualisation of the sample in a frozen and hydrated state [6]. This technique has been crucial in understanding the molecular mechanisms of various biological processes. Cryo-TEM and cryo-SEM are employed in materials science to study the morphology, composition, and properties of materials at the nanoscale. Researchers use these techniques to investigate nanoparticles, polymers, catalysts, and other advanced materials.

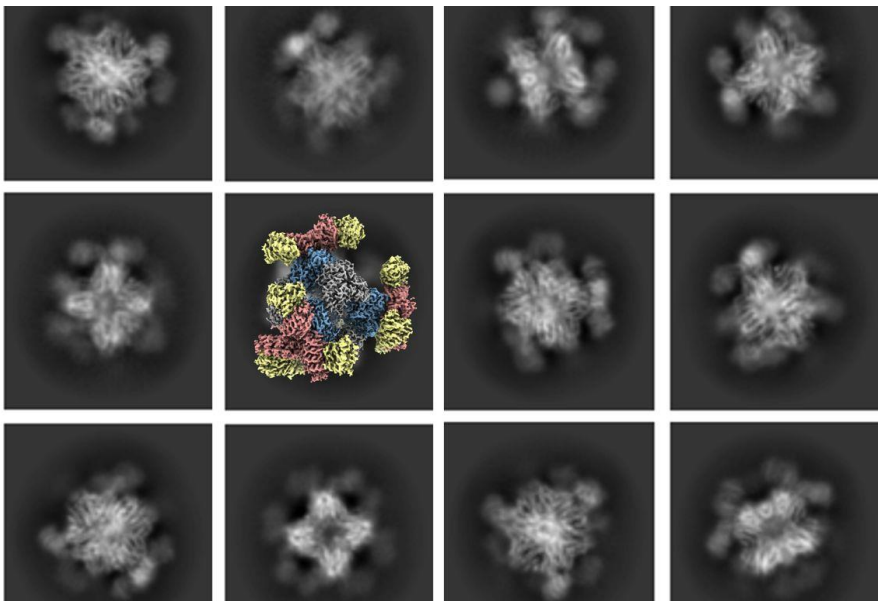

Figure 4. A collection of cryo-EM images. The grayscale images depict 2D projections from various angles of the imaging scaffold bound to a target protein. The coloured image showcases the 3D reconstruction obtained from these 2D projections.

Focused-ion-beam scanning electron microscopy (FIB-SEM) is a powerful technique used for cross-sectioning and imaging samples with nanoscale resolution. In FIB-SEM, a focused beam of ions (typically gallium ions) is used to remove (via a milling action) material, layer by layer, from the surface of a sample. This then allows for precise cross-sectioning of the sample (Figure 5). As material is removed, a scanning electron microscope (SEM) simultaneously images the newly exposed surfaces, which then provides high-resolution images of the sample's internal structure. This technique is commonly used in materials science, semiconductor manufacturing, geology, and biology to study the microstructure and composition of materials, devices, and biological specimens in three dimensions. FIB-SEM enables researchers to analyse complex sample geometries, investigate interfaces, and characterise sub-surface features with exceptional detail [7].

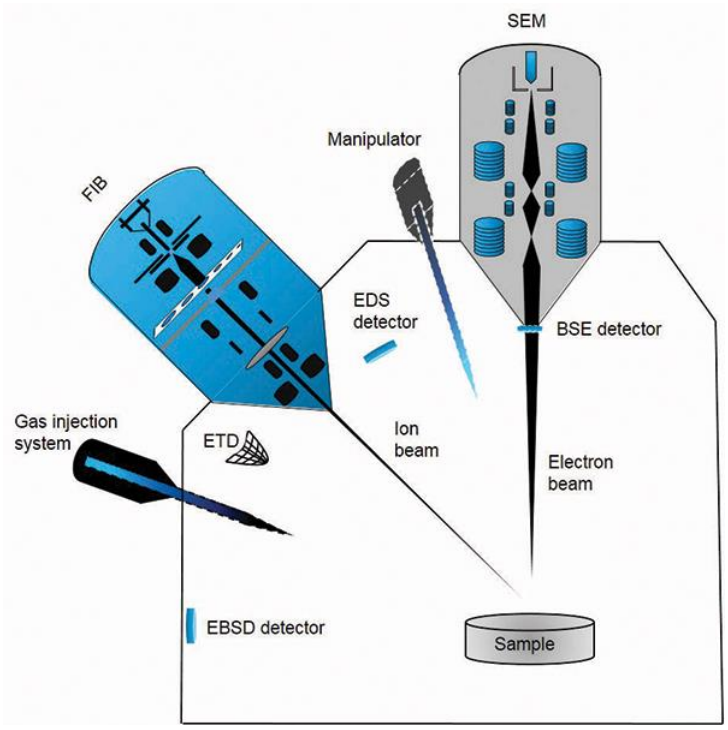

Figure 5. A typical setup of a Focused Ion Beam Scanning Electron Microscope (FIB/SEM). FIB-SEM integrates both a scanning electron microscope (SEM) and a focused ion beam (FIB). They are frequently equipped with various detectors, including Everhart-Thornley Detectors (ETD), Backscattered Electron Detectors (BSE), Energy-Dispersive X-ray Spectroscopy (EDS), Electron Backscatter Diffraction (EBSD), and in-lens detectors. Additionally, FIB/SEMs commonly feature gas injection systems and manipulators for sample handling and manipulation.

EM offers a variety of imaging modes, each tailored to specific analytical needs. Achieving high-quality images requires careful attention to sample preparation and handling. Techniques such as sample coating, mounting, and manipulation play a critical role in ensuring optimal imaging conditions. However, investigation of new processes that use the power of EM enables innovation in methods and techniques resulting in better exploration of imaging capabilities.

References

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B. PEOPLE FOCUS

GET TO KNOW

We would like to understand and share the research interest and career pathways of our PCIG members. In this section of the newsletter we will provide an overview of two of the PCIG committee members for each edition, but please contact us to share your background and experience for inclusion in future PCIG newsletters.

Brian Miller, MRSC

"I spent seven years as Managing Director at Particle Measuring Systems Ltd., helping to establish distribution throughout Europe before returning to Beckman Coulter as European Business Manager of the Particle Characterisation section."

Currently Managing Director of Meritics Ltd, I have worked in the field of particle characterisation for over forty years. I started on that journey when he joined Coulter Electronics (now Beckman Coulter) as an Applications Specialist. In that role, I developed analysis methods for particle characterisation, was involved in the development and testing of new particle characterisation instruments, and in the training customers and associates in the use of a wide variety of particle analysis methods. I set up Meritics over 20 years ago to provide sales, applications and customer service support for a wide range particle characterisation instrumentation in the UK. I have been the Secretary of the PCIG since 2014.

John Gamble MChem, MRSC

"I am an Associate Scientific Director within the Materials Science and Engineering function at Bristol Myers Squibb, Moreton where I have worked since 2003."

My role is focussed on the characterisation of particles in the pharmaceutical sector. During that time, I have championed the use of image analysis to drive material appropriate characterisation to enable better understanding of our materials and relationship to both up and downstream behaviours. I have published over 30 papers in the area of particle characterisation.

CONVERSATION WITH OUR INSPIRERS

We would love to understand your technical and social experiences, especially your untold stories throughout your learning and working journey. We would like to motivate more students and researchers to follow their passion and careers in particle science. We believe that individual examples of effort and contribution to help make the particle science world better should be recognised and publicised. If you are interested in participating, please contact us for more details!

Curiosity to explore the unknown fuels my motivation in research

"It is indeed 'cool' to see that after several failed experiments, trial-and-error work and disappointing outcomes, persistence and patience can help you to observe results that you were dreaming for months, if not years!"

Stefanos Mourdikoudis is a chemical engineer who is currently working at the University of Vigo, Spain.
He is also a member of the PCIG Committee.
He spoke to Tien Thuy Quach.

Could you please introduce yourself in general and in the scientific community?

My name is Stefanos Mourdikoudis, I am a chemical engineer by training, and I have been working in the domain of nanomaterials for several years. I have worked in various research centres and universities in several European countries. I master the chemical synthesis and characterisation of nanoparticles which find applications in fields such as energy, catalysis-electrocatalysis, environment and biology-biomedicine.

What is your favourite aspect of your research?

For me, it is important to combine academic freedom while keeping an eye open to real-world applications. I believe that it is beneficial to keep and grow an inherent curiosity for science and research. Good research inevitably needs to have the 'luxury' to be able to 'waste' some time, or to say it in a different way, to invest time in risky projects and ideas. I like the fact that in synthetic chemistry we can have a hypothesis and work on it. For example, we can ask ourselves: 'What will happen if I use this new solvent instead of the previous one, how this change will affect the characteristics of my product'? This may sometimes result in failed experiments, while other times it can also give rise to the acquisition of unprecedented very

interesting novel materials and properties! At the same time, setting 'concrete goals' and thinking on how to associate the materials that we produce with scaled-up production and real-life practical applications apart from their mere academic value, is of course another worthy objective, too.

What is the coolest thing about your work/research?

It is indeed 'cool' to see that after several failed experiments, trial-and-error work and disappointing outcomes, persistence and patience can help you to observe results that you were dreaming of for months, if not years! It is important to develop resilience and not give up easily when carrying out experimental work.

What legislation would you change to improve how science in your field is done?

I would try to change a bit the whole system regarding research proposals and funding acquisition. It seems that nowadays being able to raise funds appears more significant than doing science itself. Please don't get me wrong, I do not underestimate the importance of obtaining a grant! But writing and gaining grants is only the start of a given research project. After that the day-to-day job, which involves concentration, hard work and perseverance, will directly affect the possibilities of a certain project to succeed. For example, we can see distinguished researchers with many decades of experience and multiple academic accolades, who are still judged on the 'importance' of their research by the evaluation of the research proposals that they (still) write. These people have already shown that they are good, productive scientists. Why not let them invest their time more on 'real' scientific work and not on proposal writing? Probably another, new system has to be found on how to distribute the available funding, perhaps mostly based on meritocracy. When the research is complete, the scientific community will have the opportunity to read the amazingly written and presented publications of a given researcher. However, the research proposals, even if they belong to the class of 'masterpiece', will just be stored in a (digital or real) shelf or drawer with no big use for the scientific community for years ahead…

How did you end up here? Why did you become a scientist? What drew you to this field? What makes you get up in the morning?

I always liked chemistry, and it is my scientific curiosity that made me a scientist. In chemistry, we observe colour changes in solutions, evaporations, melting, freezing - so many interesting phenomena. As a kid, I was fascinated by such observations. When I work on a research project, after data acquisition, processing, writing and submitting a research paper, I look forward to receiving the comments of the reviewers. Some (healthy) degree of anxiety is

inevitable. Did I overlook something 'important' that the reviewer may notice? Will they understand the value of our work? How will they perceive it? All these things indeed make me 'get up in the morning'. There's more of course (that motivates me). For example, it feels nice to mentor junior colleagues, to guide them, supervise them, give advice on how to 'navigate' in academia, how to overcome obstacles of diverse types, and so on. I also like to review papers of other peers, helping them to improve their work. I consider this as a service to the community.

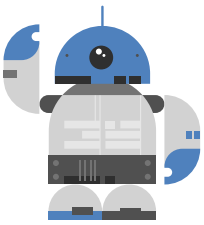
Tell me what you like to do when you aren't working on research.

I like long walks in nature or even in an urban environment. Our body is the home of our brain, so we need to take care of it. I believe that moderate exercise and healthy nutrition are more than helpful; they are favourable for our well-being but also for our performance in our scientific work. Then, having a coffee or lunch with friends and colleagues, is something which I also like a lot and I do this often, too. It helps to connect with people and re-bonding with friends or colleagues that you might not have seen for a while.

What is your advice for the next generation in your research area?

I would recommend them to spend more time daydreaming. Nowadays everybody is online in each and every moment. There is a tendency for excessive communication, promotion, and collaboration. Don't get me wrong, collaborative work is a must to tackle our complex scientific and societal challenges. And of course, communication skills are more than important in all contexts. However, new ideas and 'disruptive science' are not easy to generate from a big network of people. I believe that taking the time to reflect on our own is under-appreciated nowadays. Michael Faraday had included the following phrase in a letter to John Tyndall, in 1851: 'I have far more confidence in the one who works mentally and bodily at a matter than in the six who merely talk about it'. Therefore, I would suggest the next generation of scientists to 'take it easy', and invest some time on new ideas, that might be serendipitous, too, to some extent, but this is also fine.

INSPIRING STORIES



Do not hesitate to share your stories to motivate other researchers and students. You can write about the people, the events that motivated you throughout your learning, working and research (either the good or the bad things happened). We look forward to hearing from you.

How industrial challenges motivate my research of interest?

Written by Phil Jackson

In my role as a technical consultant, the thing that inspires me most is when clients, or indeed whole industrial sectors, face a major challenge. I find that I am motivated to ask questions and do background reading to better understand the issue and what research has been done to date. Once sufficiently informed, I love the challenge of devising R&D programmes that tackle the issue and selling the concept to clients. I am going to give two examples of past public funded projects that I helped to initiate based on worrying issues faced by the ceramic sector to explain how industrial challenges motivate my research of interest.

Figure 1. Sugarboo & Co

Back in the late 1980's the ceramic tableware industry faced the threat of lead being banned as a raw material in ceramic glazes. The ceramic plates, cups, saucers etc. that we drink and eat from typically consist of a core of blended quartz, clays and feldspar that is fired in a kiln. A thin glass covering is then applied. The silicate glass covering is called a glaze and is applied as a powdered glass suspension (by spraying or manual / robotic dipping). After applying the

glaze, the items are again placed in a kiln to convert the powder to a smooth homogeneous glass layer.

Figure 2. Pottery-making kiln. Tagphoto / Getty Images

Although the thought of lead in a glaze might worry people, the lead is locked up in the silicate glass structure in a properly formulated glaze. There are leaching tests performed to protect customers by showing the amount of lead leaching into food. This is typically at a ppm or even ppb level. Lead helps the glaze fire to a smooth, unblemished surface that is aesthetically pleasing and offers excellent durability and hygiene in use. The challenge being faced was: “What other elements in the periodic table can we use in glazes to mimic lead?” In our trials, we had to check that important properties were not lost. Could the new glasses be milled to an appropriate particle size distribution (PSD)? Would the glass powders suspend in water to give the correct rheological properties for spraying? Would the final fired glass layer have the correct thermal expansion for the core below and would it be (i) aesthetically pleasing and (ii) durable in a dishwasher? Ultimately, the threat of banning lead didn’t happen. Instead, stricter limits for lead released into acetic acid (mimicking worst-case food scenarios) were introduced. Having said that, many ceramic producers have transferred to unleaded glazes.

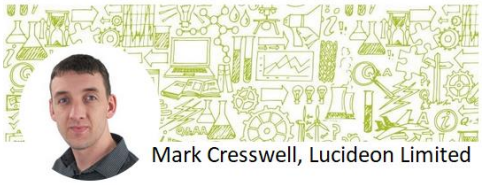
In a second project, the ceramics industry was challenged with the prospect of stricter regulations on the amount of airborne crystalline silica (e.g. quartz, cristobalite) that factory workers could be exposed to. This would have had crippling implications for small or medium-sized enterprise (SME) companies in terms of extra testing and abatement equipment leading to potential company closures. Respirable Crystalline Silica (RSC) can be a serious issue leading to silicosis. However, since the 1950’s regulations have been established to almost eliminate silicosis. I formed a European consortium (academics, industrial companies and

research organisations) that aimed to generate data showing that current regulations were appropriate. We used two approaches: firstly, rather than using the current QC test of monitoring the total amount of RCS drawn onto a filter (and measuring mg of RCS per dm^3 of air) we did factory trails to collect airborne RCS using glass slides and filters that aimed at separating the powder according to particle size. It is well known that the probability of particles entering into the deeper areas of the lung changes with PSD. By measuring the PSD, we were then able to apply mathematics to show that only a small percentage of the RCS particles workers experienced could cause damage. Secondly, by working with cell biologists in Germany we were able to show that the cytotoxicity of RCS on factories was far less than that of freshly cleaved silica (in, e.g. a mining scenario). In short, the water used during ceramic powder processing (milling, casting etc.) changes the chemistry of silica powder surfaces to render them less destructive to the macrophage cells (cells that encapsulate unwanted debris in the lungs leading to expulsion as phlegm.

New experience of attending the Society of Cosmetics Scientist Conference

Mark Cresswell is leading the Formulated Products team within the consultancy division at Lucideon. Mark shares his experience of attending one recent conference. He spoke to Phil Jackson.

An interview with:


Mark Cresswell, Lucideon Limited

Please tell us briefly about yourself and your recent conference.

I am leading the Formulated Products team within the consultancy division at Lucideon that is a company that provides confidential technical consultancy work to clients across a broad range of industrial sectors. Historically, powders have featured very strongly in consultancy linked to optimising and developing formulations. The Society of Cosmetics Scientists (SCS) Conference was held at the Coventry Building Society Arena (formerly called the Ricoh) in November 2023. The event features an exhibition (stands providing information associated with leading producers and suppliers), educational lectures as well as demonstrations (e.g. mixing formulations) and workshops. For the first time, Lucideon decided to have a stand at the exhibition manned by technical, marketing and sales staff.

How did the decision to attend SCS come about?

Cosmetics is a relatively new consultancy area for us, but we have attended previous SCS events as a delegate to understand more about the range of cosmetics formulations sold. The

technical presentation sessions were useful in this respect and showed, for example, that emulsions as well as powder dispersions are important. We had also attended the “In Cosmetics” event in Barcelona (again as a delegate) earlier in the year which introduced us to a number of potential clients. This gave us the confidence to progress having a stand at the SCS 23 event.

Figure 1. Society of Cosmetics Scientist Annual Conference

In your discussions with cosmetic producers and suppliers at SCS 23, did powders / particles feature much? Could give us some examples?

I would say that emulsions (e.g. skin creams) rather than suspensions were a strong focus for the people we spoke to. Of course, analytical techniques used to characterize particle suspensions (particle size, formulation rheology, ζ(zeta)-potential etc.) are often relevant to systems where you have oil droplets in water. As far as powders were as concerned, we found strong traction with powder raw material suppliers. Moreover, a number of companies were wanting help to promote the use of natural minerals as therapeutic fillers in skin cream. Companies were asking if we could identify the optimum powder loading in creams and check stability / compatibility with other ingredients. Another need was ideas we could provide to support claims. A second strong theme was identifying options to reduce the level of water in products such as shampoo (with the water only added by the user immediately prior to, or during, use). Less water means reduced transport costs and a more attractive carbon footprint. It seems that fibre particulate additives have a strong role to play in this field.

Did you learn anything about the analytical techniques typically used by the cosmetics industry to control powder raw materials?

Not really. There is clearly a large demand for microbiological testing and the use of techniques such as ICP (Inductively Coupled Plasma) to check for the presence of heavy metals. Having said that, the use for fibres that I have just mentioned suggests that shape analysis will be

important since milling fibres to an ideal aspect ratio will be very critical to final product performance. We can also see that particle size (both micron and sub-micron), rheology, ζ-potential and techniques that can predict sedimentation will be very important tools in consultancy work proposals that we put to clients.

Figure 2. Mark Cresswell (far left) engaging with potential clients at “In Cosmetics”, Barcelona

Finally, what other industrial sectors are you considering approaching and to what extent does your expertise in powder characterisation inform decisions?

We already operate in a huge range of industries and powders are very often a critical aspect of formulations. However, to some extent we tend to work reactively, supporting clients only when they approach us. The bulk of our work is from repeat business with existing clients. Time and cost limit the number of new industries we can proactively target through marketing and sales. For the coming year, we will certainly continue to probe the cosmetics field. We will, for example, have a stand at “In Cosmetics”, given the large number of raw material suppliers who attend. We will also be attending a suppliers day event in America targeting the cosmetics industry. In terms of other sectors, we will be pursuing potential pharmaceutical clients via events such as “Making Pharma”. The drive to move tablet pressing from wet granulation to direct compression is an area we are seeing huge demand due to massive potential savings in factory space, throughput and labour. You can find out more about SCS Formulate (both the 2024 event and last year’s event) at https://www.scsformulate.co.uk/.

C. UPDATE CORNER

Q&A FOR E-NEWSLETTER

Royal Society of Chemistry Opportunity – Calling all students

Written by Mel Disher

The PCIG are delighted to share with our readers that becoming a student member of the RSC is now FREE for all undergraduate students in the UK and Ireland. The RSC is offering students working towards a qualification in chemical sciences free membership using the **code CATALYST100** at the checkout.

What can the RSC offer you as a student member?

- Online careers services
- RSC Pathfinder
- Early careers networking
- Discounts on conferences
- Free Access to the RSC library in London
- Mentoring programs

The above are just a few of the benefits involved in a membership to the RSC. Find out more about the FREE membership and all the benefits you gain from being a member using the link below!

https://www.rsc.org/membership-and-community/join/student-member/#benefits

A Christmas Meet-Up for the PCIG

Written by Mel Disher

On December 5th 2023, the PCIG hosted an event, 'Material Characterisation in the Nanoscale', a workshop aimed at both academia and industry with the aim to give attendees an introduction to multiple techniques used to characterise particles in the nanoscale.

The event took place at the home of the Royal Society of Chemistry, Burlington House in London. The talks were delivered in the library, which is a beautiful room to provide educational sessions. There were around 50 participants at the event despite the pre-Christmas train strikes. During the one-day event our speakers gave talks on eight different characterisation techniques. The talks covered: scanning electron microscopy, transmission electron microscopy, nano tracking analysis, differential centrifugal sedimentation, particle counting, single particle extinction, dynamic light scattering and online dynamic light scattering.

Figure 1. Speakers with inspirational talks at the event

Not only were there amazing speakers, but also during the breaks there were excellent opportunities to exchange research ideas and make valuable connections in the particle characterisation world. The PCIG committee were also able to meet after the event for a committee meeting and a festive get-together. Stay up to date with future events arranged by the PCIG with our newsletters, our events also have a discounted student rate to encourage attendance and allow great networking opportunities for early career scientists.

Update about upcoming PCIG events

Written by Tien Thuy Quach

Two upcoming events hosted by Particle Characterization Interest Group-Royal Society of Chemistry (PCIG-RSC) will be summarised as follows. Please be mindful that they are the first announcements; specific details will be updated in upcoming months.

1) Workshop-Training: "Microstructure analysis using BET surface area, pore size, chemisorption, gas/vapor sorption and associated techniques"

This is the third in the Royal Society of Chemistry Particle Characterisation Interest Group one day Training/technical meetings concentrating on surface/pore analysis. A line up of expert speakers will cover the fundamental principles of each measurement technology, with an emphasis on its practical

application with a view to assisting technicians, operators and researchers choose the most appropriate measurement tools while understanding the strengths and limitations of each technique.

The meeting should appeal to all those wishing to gain a greater understanding of these techniques with an emphasis on practical and applied aspects. One of the most valuable aspects of these meetings is the ability to discuss informally with recognised experts in the field throughout the day.

Date: **2nd July 2024**

Location: **The Science suite, Burlington House, London**

Price: **PCIG/RSC Member £99**

Non-Member £150

Concession (student, university technician, retired) £49

For the interactive nature of this event, exhibitors are encouraged to attend; a space will be included in the price if two full registrations are taken (£300). Early uptake is recommended as space is limited.

2) Conference: FORGE 2024 – Particles in the real world

We are delighted to announce the third in the Forge series of conferences following successful events previously held virtually and in-person in Belfast.

The Forge is a special conference which encourages presentations from early career scientists and PhD students together with inspiring plenaries from industry and academia. This conference aims to raise student awareness of how critical optimisation of particulates is when it comes to creating reliable end products across all sectors.

As well as talking about the science we encourage all our presenters to show their passion, what excites them about this work. This time we are at the Cloth Hall Conference Centre, part of the **University of Leeds, 12-13th November 2024**.

An events page on the RSC website will be up shortly, but in the meantime please email stephen.ward-smith@malvernpanalytical.com for further details.

OTHER UPCOMING EVENTS OF INTEREST

Written by Mel Disher

UK-based events

- The 5th UK Workshop on Membrane Proteins
  22 – 24 April 2024 Birmingham UK

https://www.rsb.org.uk/events?event=the5thukworkshoponmembraneproteins#:~:text=The%205th%20UK%20Workshop%20on%20Membrane%20Proteins%20training%20event%20will,and%20laboratory%2Dbased%20practical%20sessions

- GW4 Cytomics Symposium: Networking and Innovation at the Forefront of Science
  25 April 2024 Exeter UK

https://www.eventbrite.co.uk/e/gw4-cytomics-tickets-803813807737?aff=ebdssbdestsearch&keep_tld=1

- Flow into the Future: Cytometry and Spatial Biology Explored
  3 May 2024 Edinburgh UK

https://www.eventbrite.co.uk/e/flow-into-the-future-cytometry-and-spatial-biology-explored-tickets-652050178637?aff=ebdssbdestsearch&keep_tld=1

- London Biotechnology Show
  8 May 2024 London UK

https://www.eventbrite.co.uk/e/london-biotechnology-show-tickets-641841323677?aff=ebdssbdestsearch&keep_tld=1

- Industrial Biotechnology Innovation Catalyst (IBIC) Launch
  9 May 2024 Manchester UK

https://www.eventbrite.co.uk/e/industrial-biotechnology-innovation-catalyst-ibic-launch-tickets-858738198067?aff=ebdssbdestsearch&keep_tld=1

- Early Career Scientist Research Symposium
  15 May 2024, Bristol UK
  More details will be updated on the event website.
- CHEMUK
  15 – 16 May 2024 Birmingham UK

https://www.chemicalukexpo.com/?gad_source=1&gclid=Cj0KCQjw2a6wBhCVARIsABPeH1sDl_72lDl2oCd2MhdJXIpBJoz0Ynv9Lx4EGmHA7q2SalBNTDTi9xMaAj3nEALw_wcB

- Oxford STEM Network - May meet up
  21 May 2024 Oxford UK

https://www.eventbrite.co.uk/e/oxford-stem-network-may-meet-up-tickets-814031880267?aff=erelpanelorg

- Synthetic & Engineering Biology British Swiss Summit
  22 May 2024, Bristol UK

https://www.ibioic.com/events-database/synthetic-amp-engineering-biology-british-swiss-summit

- Rheology Masterclass 2024
  23 May 2024 Stockport UK

https://www.eventbrite.co.uk/e/rheology-masterclass-2024-tickets-870980765917?aff=ebdssbdestsearch

- The CMS experiment at CERN
  28 May 2024 London UK

https://www.eventbrite.co.uk/e/the-cms-experiment-at-cern-tickets-845931282237?aff=ebdssbdestsearch

- Drugs Research Network Scotland Annual Conference
  5 June 2024 Edinburgh UK

https://www.eventbrite.co.uk/e/drugs-research-network-scotland-annual-conference-tickets-873322459987?aff=ebdssbdestsearch

- ScotChem Polymer & Soft Materials III Conference
  13 – 14 June Glasgow UK

https://www.eventbrite.co.uk/e/scotchem-polymer-soft-materials-iii-conference-tickets-857015675957?aff=ebdssbdestsearch

- Early Careers Colloid conference (ECCo) 2024

20 – 21 June 2024, London UK

https://eccolloid.co.uk/ecco-2024/

- Workshop-training “Microstructure analysis”
  2 July 2024 London UK
  More details will be updated on the event website.
- Biomaterials Translation Workshop 2024
  2 July 2024 Manchester UK

https://www.eventbrite.co.uk/e/biomaterials-translation-workshop-2024-tickets-850716123827?aff=ebdssbdestsearch

- The Early Career Researcher Macrocyclic and Supramolecular Chemistry (ECR MASC) Conference 2024
  23 July 2024 Glasgow UK

https://www.eventbrite.co.uk/e/ecr-masc-2024-tickets-851370581327?aff=ebdssbdestsearch

- British Society for Nanomedicine (BSNM) Annual Meeting 2024
  9 – 10 September 2024 Cambridge UK

https://www.britishsocietynanomedicine.org/upcoming-conferences/

- Aston Institute for Membrane Excellence: Institute launch event
  13 September 2024 Birmingham UK

https://www.eventbrite.co.uk/e/aston-institute-for-membrane-excellence-institute-launch-event-tickets-849281101637?aff=ebdssbdestsearch

- The FORGE 2024 Conference
  12 - 13 November 2024 Leeds UK
  More details will be updated on the event website.
- UKEV Forum 2024
  16 - 18 December 2024 Newcastle UK
  More details will be updated on the event website.

International Events

- International Conference on Material Science & Nano Technology
  13 – 14 May 2024 Paris

https://www.stripeconferences.com/material-science-conferences/

- Brightlands Polymer Days 2024
  27 – 28 May 2024 The Netherlands

https://www.brightlands.com/en/chemelot-campus/event/brightlands-polymer-days-2024

- Exosomes Europe
  5 – 6 June 2024 London UK

https://informaconnect.com/applications-of-exosomes/?utm_source=tag-digital&utm_medium=cpc&utm_campaign=&gad_source=1&gclid=Cj0KCQjw2a6wBhCVARIsABPeH1uQvvWkPgbXYMWyiOMPTPGWO9bbXkfrZZ8stwqBcLTq6hZ408VauTAaAnCIEALw_wcB

- 14th International Conference on the Scientific and Clinical Applications of Magnetic Carriers
  17-21 June 2024, Barcelona, Spain

http://magneticmicrosphere.com/meeting-fourteenth

- Microbubble and Nanobubbles – Fabrication to Application
  15 - 16 July 2024, Leeds UK

https://microbubbles.leeds.ac.uk/microbubble-symposium/

- International Chemistry Congress
  19 – 20 August 2024 London UK

https://www.stripeconferences.com/international-chemistry-congress/

- International Conference on Pharmaceutics, Formulations & Drug Delivery Systems
  19 – 20 August 2024 London UK

https://www.eventbrite.co.uk/e/international-conference-on-pharmaceutics-formulations-drug-delivery-sys-tickets-860671701227?aff=ebdssbdestsearch&keep_tld=1

- IEEE 14th International Conference “Nanomaterials: Applications & Properties"
  8 – 13 September 2024 Riga Latvia

https://www.rsc.org/events/detail/78464/2024-ieee-14th-international-conference-nanomaterials-applications-and-properties

- Porosity and Surface Area Characterization 2024
  28 November 2024, The Netherlands

https://www.solids-solutions.com/academy/courses-seminars/courses/porosity-and-surface-area-characterization-2024/

- 17th International conference on materials chemistry (MC17)
  7-10 July 2025 Edinburgh UK

https://www.rsc.org/events/detail/77989/17th-international-conference-on-materials-chemistry-mc17

The PCIG are always happy to hear about up-and-coming events that our members are interested in if you have any suggestions for events to be included in our newsletters, please contact us and we will include these in our next edition.

CONTACT US

Visit our website for further information: **https://www.rsc.org/membership-and-community/connect-with-others/through-interests/interest-groups/particle-characterisation/**

Do you have any questions, feedback or are you willing to contribute as a collaborative writer? Please email the RSC-PCIG Particle Newsletter Team via: **Particlenewsletter@gmail.com** and we will get back to you.