

# Newsletter 4 (PCIG N4) 26.04.2024

Welcome to the fourth edition of our newsletter!

# PREFACE

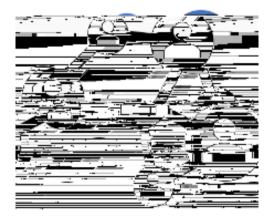
This newsletter aims to serve as a means of internal communication of useful information and strengthen engagement among the group members. This  $T X D U W H U \P V Q H Z V O H W W H U$  edition (January –April 2024) consists of three main sections:

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

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& ×8SGDWH, With Cost in 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 pho23plexito23pg [(w)ttasmon,-123(un(pa)3(r)7(t)6(pl)6(asmi)5(ated 12i(ct)6eg88 uii6ir)-3 d4()-20 e.05et4 Tf0.073 0 e.05etn Tf 10's 3 0 595:445is 562.63 Tm -3 5(11.04W\* n ti4 56241.68 r58'g 0.562.60

Particle Characterisation Interest Group



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 tha W ORRNV OLNH LW  $\P$  V OD IA) and many similar images have been used to FUHDWH  $\mu$ PHPHV $\P$  ) LJXUH 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



#### 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 pTD2s 10mposditien,4(en)3()ean

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[3] ThermoFisher. Materials science: Seeing with Electrons: The Anatomy of an Electron Microscope. 2020. Available at: <u>https://www.thermofisher.com/blog/atomic-resolution/seeing-with-electrons-the-anatomy-of-an-electron-microscope/</u>

[4] RTI Laboratories. SEM/EDS Analysis. Available at: https://rtilab.com/techniques/sem-eds-analysis/

[5] UCLA (2023). UCLA-led team develops key improvement to Nobel Prize-winning technology. Available at: <u>https://newsroom.ucla.edu/releases/tripod-tethers-advance-in-cryo-electron-microscopy</u>

[6] Raymond Wightman. An Overview of Cryo-Scanning Electron Microscopy Techniques for Plant Imaging. 2022. Available at: <u>https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9106016/</u>

[7] Wolff, A. Focused ion beams: An overview of the technology and its capabilities. Wiley Analytical science (2020). Available at: <u>https://analyticalscience.wiley.com/content/article-do/focused-ion-beams-overview-technology-and-its-capabilities</u>



# **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

If 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 ´

Particle



LQHYLWDEOH 'LG, RYHUORRN VRPHWKLQJ YMill RhoeyRUWDQW understand the value of our work? How will they perceive it? All these things indeed make me µJHW XS LQ WKH PRUQLQ (thttp://www.com.org/com.org/actives/c



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<sup>3</sup> of air) we did factory trails to collect airborne RCS using glass slides and filters that aimed at



technical presentation sessions were useful in this respect and showed, for example, that HPXOVLRQV DV ZHOO DV SRZGHU GLVSHUVLRQV DUH LP & RVPHWLFV· HYHQW LQ % DUFHORQD DJDLQodDced us GHOHJI to a number of potential clients. This gave us the confidence to progress having a stand at the SCS 23 event.

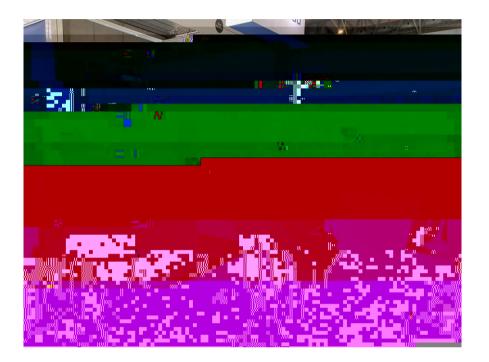
Figure 1. Society of Cosmetics Scientist Annual Conference

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 V X V S H Q V L R Q V S D U W L F O H (/zetd)/potential etd?) Ane Often Irelevant tbK H R O R J N 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.



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-PLFURQ UKHRORJ potential and techniques that can predict sedimentation will be very important tools in consultancy work proposals that we put to clients.



### Figure 2. ODUN & UHVVZHOO IDU OHIW HQJDJLQJ ZLWK SRWHQW

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 ZLOO H [ D P S O H Colstributions]; givenVthWe DargeGnunibet/ of rawQmaterial IRU 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 FOLHQWV YLD HYHQWV VXFK DV ‡ O D N L Q J 7 K H 3 K D U P D · 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 Hhttps://www.sczsco.cmul@teDcv/.Mk/. \ H D U ¶ V H ) R U P X O D W H ERWK WKH

Particle



Figure 1. Speakers with inspirational talks at the event

Not only were there amazing speakers, but also during the breaks there were excellent



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 2024Location:The Science suite, Burlington House, LondonPrice:PCIG/RSC Member £99Non-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, 12-13<sup>th</sup> November 2024

An events page on the RSC website will be up shortly, but in the meantime please email <u>stephen.ward-</u> <u>smith@malvernpanalytical.com</u> 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



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



#### 20 -21 June 2024, London UK

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

Workshop-WUDLQLQJ ‡OLFURVWUXFWXUH DQDO\VLV-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



14<sup>th</sup> 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

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8 -13 September 2024 Riga Latvia

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

applications-andq 0.000008873 0 595.44 841.68 re W\* n BT /F1 9.96 Tf 1 0 0 1 128.06 461.83 TW\* n BT /F1 9.96