

NanoPAT Newsletter

May 2022

Online real-time characterisation solutions for
nanoparticle production processes

#04

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Welcome

Dear reader,

The NanoPAT project is glad to present its fourth project newsletter with the main aim of sharing with you our latest technical achievements, introducing our innovative partners and sharing with the community inputs and curiosities related to nanotechnology and process monitoring.

In this issue you will find an update of the project status. Furthermore, two of NanoPAT's project partners will be presenting themselves. Additionally, some achievements of the last months will be highlighted!

As we are in the middle of the project, we already had our successful first review meeting in M20 where the project officer and external expert gave us great feedback that will guide us in the upcoming months. Furthermore, some preliminary results have already been obtained and we will have the opportunity to present them to the public by participating in upcoming fairs and workshops. On behalf of the NanoPAT project I

would like to thank you all for being interested in innovation and technology asking you to stay tuned during the next two years!

If you are interested in the evolution of NanoPAT activities, coming from an academic, industry, or other perspective, and would like to closely follow the progress of the project and its outcomes, do not hesitate to contact us on nanopat_coordination@iris-eng.com and to subscribe to our newsletter to receive further information and explore possible collaborations.

Best regards and enjoy the read,



Ioannis Kakogiannos,
Coordinator of NanoPAT



Project status

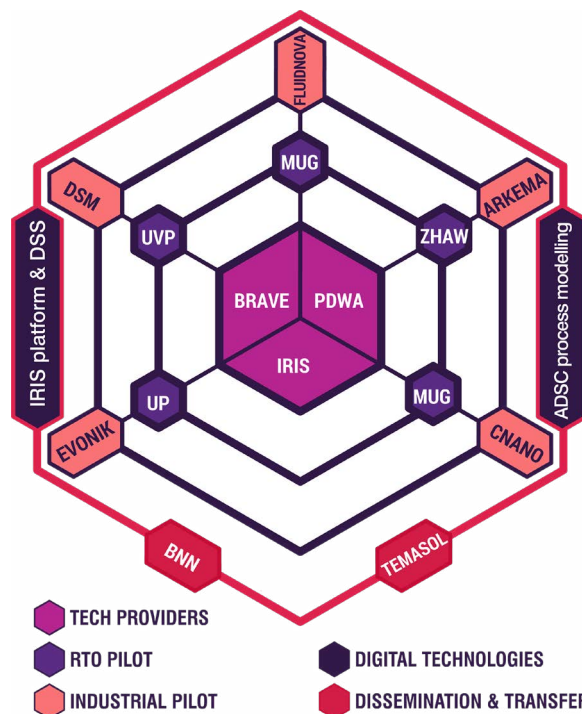
In January 2022, NanoPAT had its first Review Meeting where we showed our Project Officer, and our external expert the progress on the developments within the project, the achievements during the first reporting period, as well as our upcoming plans. They gave us great feedback that will guide us in the upcoming months.

During the last six months, NanoPAT has finalised the descriptions of the 5 Case Studies (the nanoparticles to be monitored are polymers, silica, hydroxyapatite, zeolite and ceramic) for the integration of the monitoring technologies and the CFD simulation. The validation process at lab scale of the three monitoring technologies (BRAVE, PDWA, IRIS) has/is taking place in the three RTO pilots (UP, ZHAW and UPV) and the scale-up suggestions on where the different nanomaterial monitoring devices will be placed for the scale-up tests in the industrial pilot plants have been done.

Furthermore, relevant work is being performed between Analisis-DSC and the PAT technology providers for the integration of the three technologies and to prepare the future installation of the sensors/prototypes in the facilities of the end users (Fluidinova, Cnano, Evonik, Arkema, DSM) for the industrial pilot scale validation of the technologies.

Once the pilot scale validation is successful and the end users prepare their pilot lines for hosting the prototypes, we will head into the industrial pilot plant demonstration of the technologies.

At the same time, a lot of activities are being organised by BNN and TEMASOL towards collaboration with other EU funded projects with si-



Overview of roles of the partners in NanoPAT

imilar or supplementary activity. Additionally, the project partners have been very active with the organisation and/or participation in conferences and other events to promote their research, as well as external and internal knowledge transfer activities for exchanging ideas internally and with professionals of the industry that are eager to integrate tools that can help us fulfill the common goal.

Over the next period, BNN is also involved in the organisation of very interesting events for the dissemination of our results. NanoPAT will be very active in workshops and events in the upcoming months, so stay tuned for more information on this aspect.

Partner presentations

In this issue, we will present the project partners ZHAW and PDWA.



About Zurich University of Applied Sciences (ZHAW)

The Zurich University of Applied Sciences is one of the leading universities of applied sciences in Switzerland. It offers teaching, research, continuing education and other services that are both practice-oriented and science-based. With locations in Winterthur, Zurich and Wädenswil, the ZHAW is firmly anchored in its region whilst collaborating with international partners.

ZHAW was formed in 2007 with a cantonal re-organisation, but it dates back to the “Technikum”, the first in Switzerland, which was founded in Winterthur in 1874 with Mechanical Engineering and Chemistry a year later. Today ZHAW is organised in eight different Schools covering a broad range of applied sciences with about 14.400 students in Bachelor and Master courses and 1.200 lecturers and professors.

Research & development at the ZHAW focuses on key societal challenges, with a particular emphasis on energy and societal integration. With its expertise in sustainable development and digital transformation, the ZHAW imparts forward-looking knowledge and takes an active

part in shaping the digital and ecological transformation.

The Institute of Chemistry and Biotechnology is part of the School of Life Sciences and hosts the Centre of Industrial Chemistry and Processes. The core competence of the Centre of Industrial Chemistry and Processes is the development and holistic optimisation of chemical processes and industrial manufacturing processes. Our strength is the combination of different methods such as process analytics, chemometrics, measurement, control and automation technology and continuous reaction control. In addition to technical feasibility, we also attach importance to the consideration of ecological and economic factors.

Bringing together industrial experience, state-of-the-art lab infrastructure and research in the context of process analytical technologies (PAT) of the Industrial Chemistry group (A. Ecker) and recognised academic research of the Polymer Chemistry group (D. Brühwiler) in the field of nanoporous materials is the ideal pre-requisite

for the cooperation with Arkema in the NanoPAT project. With its expertise, ZHAW has shown that Photon Density Wave (PDW) spectroscopy seems to be well suited to monitor the synthesis of zeolites in real time. For the new continuous synthesis of industrially relevant zeolites, the application of PDW spectroscopy will be developed together with Arkema within the NanoPAT project.

About PDW Analytics GmbH (PDWA)

PDW Analytics is a scientific company specialised on Photon Density Wave (PDW) Spectroscopy, an innovative fibre-optical Process Analytical Technology (PAT) which characterises the optical properties of emulsions or suspensions. Additionally, dilution-free particle sizing in the nanometer and micrometer scale is its unique virtue. With its pure fibre-optical probe, this technology is easy to install inline or online in any (bio)chemical or physical process, as e.g. in fermentation, polymerisation or homogenisation reactors. Besides the PDW technology, PDW Analytics offers sophisticated consulting in the area of particle sizing methods as well as process understanding and process optimisation.

PDWA is based in Potsdam, Germany, and was founded in October 2013 as a spin-off company from the Centre of Innovation Competence inoFSPEC (Innovative Fibre-Optical Spectroscopy and Sensing), a joint venture of the Physical Chemistry of the University of Potsdam (UP) and the Leibniz Institute for Astrophysics Potsdam. The company still works closely together with the University of Potsdam, collaborating with them in numerous research projects that

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[Despina Emmanouilidou](#), Scientific Assistant
Industrial Chemistry

[Dominik Brühwiler](#), Polymer Chemistry /
Nanoporous Materials

focus, among other, on the advancement and application of the PDW technology.

PDWA is proud of its extremely well and diversely trained employees, having backgrounds in the management of small to very large scale (> 1 Mio. EUR) commercial and public funded projects with national and international partners from academia and industry alike.

Within the NanoPAT project, PDWA is leading Work Package 2 which aims to develop an inline monitoring tool based on PDW Spectroscopy for the real-time characterisation of polymer dispersions (in collaboration with the University of the Basque Country, Spain), nano-silica (in cooperation with the University of Potsdam, Germany), and zeolite nanoparticles (in cooperation with the Zurich University of Applied Sciences, Switzerland). This tool shall subsequently be implemented in the production processes at the sites of the industrial partners Covestro, Evonik and Arkema (WP6).

Furthermore, PDWA is contributing to Work Packages 1 (Definition of nanoparticle monitoring requirements for each case study), WP5 (PAT

platform to combine PDW with the other PAT technologies OF2i and TUS, and for subsequent data analysis), and WP7 (Knowledge transfer and dissemination), and WP8 (Market strategy and innovation impacts).

PDWA provides, for the first time, real-time process information on challenging nanoparticle syntheses in an industrial context of significant value creation. Thus, it is anticipated that the

PDW technology will contribute to more efficient industrial processing.

Contacts:

[Roland Hass](#), CEO of PDW Analytics

[Anika Krause](#), Internal coordination and management



Highlights

In this section we highlight our project partner [TEMAS Solutions GmbH \(TEMASOL\)](#), who joined the NanoPAT Consortium a couple of months after the project started.

TEMAS Solutions is an SME based in Switzerland with hands-on experience in the development and implementation of SbD frameworks at the industrial level. TEMAS Solutions is currently engaged with the implementation of sustainability within the context of Safe-and-Sustainable-by-Design (SSbD) through several EU initiatives. This is only possible due to our multidisciplinary expertise in regulatory toxicology, human and environmental risk assessment, sustainability through LCA, standardisation activities, and several years of experience working with industry in different countries and different sectors (chemicals, cosmetics, and medical devices), resulting in TEMAS Solutions leading the efforts in the development of a CEN Safe-by-Design standard. TEMAS Solutions brings expertise in the implementation of International Standards on Assurance Engagement (ISAE) 3402, business process design, business model develop-

ment, financial planning, and quality assurance experience in the development of IT-Platforms. Within NanoPAT, besides Safe-by-Design (SbD) and dissemination (WP7) TEMAS Solutions is involved in the knowledge transfer of developed technologies to other potential users to identify, evaluate, and propose models to assure exploitation of the technologies (WP7 and WP8). TEMAS Solutions will also have a strong role in the standardisation of the technologies, by managing the interaction with standardisation bodies, and promoting the development of standardised methods for technologies integration, use, and maintenance (WP8). TEMAS Solutions draws from its experience guiding Start-Ups and SMEs in developing business plans and models and leads the effort to support the sustainability of the developed technologies in NanoPAT (WP8). TEMAS Solutions also leads in supporting NanoPAT in finding the right data

management solution for the developed technologies, addressing data confidentiality concerns of technology developers, RTO's and end-users, supporting in assessing the requirements for the data management platforms being developed in the project, standardisation of data and meta-data, and applying GDPR and FAIR principles to

the developed NanoPAT technology data solutions (WP8).

Contacts:

[Blanca Suárez Merino](#), founder of TEMASOL

[Devendra Joshi](#), co-founder of TEMASOL



NanoPAT News

During the last six months (November 2021 - May 2022), NanoPAT was very active. Several visits were performed between partners with the main objective of **networking and internal knowledge transfer activities** to ease the developments within the projects in the upcoming months:

- On 14th April 2022, the EU-H2020 project [NanoCommons](#), gave NanoPAT partners an interactive online workshop on implementing Instance Maps for linking SOPs and data to Electronic Laboratory Notebooks for nanosafety assessment. Read [here](#) why these Instance Maps are relevant.
- From 11th - 22nd April 2022 some members of the UP team visited POLYMAT to support them with the maintenance of the PDW spectrometer and the analysis of the measurement data. Read more about it [here](#).
- On 11th May 2022, the UP team visited the industrial plants of Evonik where the PDW technology is to be implemented, in order to identify ways to set up the technology as well as potential technical / safety challenges. Read more about it [here](#).
- On 24th May 2022, the UP team visited the industrial plants of Covestro, where the PDW technology is to be implemented, in order to identify ways to set up the technology as well as potential technical / safety challenges. Read more about this soon on our project website and in our next newsletter.

Other activities that are relevant to be highlighted:

- On 11th April 2022, Marvin Münzberg, from UP/innoFSPEC, made a Podcast highlighting innoFSPEC's important role in the knowledge transfer between university and industrial partners, particularly in the field of process analytical technologies (PAT). Listen to the podcast [here](#).

NanoPAT Retrospect

The last six months have been very active for NanoPAT! Read about our latest activities here:

Events with an active role of NanoPAT:

- ➔ National congress on nanomaterials, science and technology, 29th - 30th November 2021, Bilbao (Spain) (Materialen Zientzia eta Teknologia V. kongresua). On 30th November, in the session “Characterisation of polymers”, Usue Aspiazu, from UPV/POLYMAT, presented under the title “Comparison of reference techniques for the analysis of latex particle size (dp) and particle size distribution (PSD)” the first results of her studies related to the NanoPAT Case Study 1 on in-line monitoring of emulsion polymerisation reactions to produce polyacrylate dispersions. Read more [here](#).
- ➔ 1st NanoMECommons Workshop on “Materials characterisation challenges to support the industry transition in the digital era”, 10th December 2021, online. The project coordinator Ioannis Kakiopoulos (from IRIS) was an invited speaker in the workshop. Under the title “Do our communities consider meso and nanomaterials in depth?”, Ioannis shared with the audience an insight and his experience with real-time process analytical technologies in the NanoPAT project, highlighting the 3 PATs that are being developed and concepts of Interoperability – Standardisation – Harmonisation of data. Read more [here](#).
- ➔ OYSTER Open Day Workshop on 17th March 2022, online. Read more about NanoPAT’s participation in this event [here](#).
- ➔ 10th PhD Students Workshop on Polymer Reaction Engineering 2022 (20th - 22nd April 2022, San Sebastian, Spain) with an oral presentation and poster of UPV/POLYMAT results on their research with inline monitoring techniques for polymer nanoparticles. Read more about it [here](#).
- ➔ 20th NanoNET Austria & 1st NanoSyn3 Joint Meeting, 22nd April 2022, Graz (Austria), with an oral presentation of BRAVE. Read more about it [here](#).
- ➔ On 8th - 12th May 2022 (San Sebastian, Spain), UPV/POLYMAT presented the results of their work on inline monitoring of emulsion polymerisation reactions of acrylates by PDW Spectroscopy in the GEP-SLAP 2022 congress, with a poster and flash presentation. Read more about it [here](#).

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Upcoming Events

Before we head into the Summer break, have a look to the upcoming events where NanoPAT will be present:

- [BioNanoNet Gold Member Webinar](#) (31st May 2022, online), with an oral presentation of BRAVE and BNN
- [Conference of Chemical Engineering PESXM13 - Panhellenic Scientific Conferences of Chemical Engineering](#) (2nd - 4th June 2022, Patra, Greece), with an oral presentation of Cnano
- [NanoWeek](#) (20th - 24th June 2022, Limassol, Cyprus), with a presentation from BRAVE and TEMASOL
- [Analytica 2022](#) (21st - 24th June 2022, Munich, Germany), where NanoPAT will have a booth
- [Achema](#) (22nd - 26th August 2022, Frankfurt, Germany)
- [APACT 2022](#) (11th - 14th September 2022, Chester, UK)
- [Course on Emulsion Polymerization Processes 2022](#) (12th - 16th September 2022, San Sebastian, Spain)
- [17th Process Analytics Colloquium \(PAT\)](#) (19th - 21st September 2022, Amesfoort, Netherlands)
- [NanoInnovation 2022](#) (21st - 24th September 2022, Rome, Italy)

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