



The Future of Formulation Development - Using Synchrotron Light

Do you know how to obtain key information from your formulations using synchrotron light?

Synchrotron light has been used in the last decades to study formulations manufactured by the pharmaceutical, cosmetic and food industry. The use of synchrotron light has allowed characterizing liquid and solid formulations, i.e. fingerprinting compounds and quantifying traces of polymorphs in a solid tablet formulation, and characterizing variants in biopharmaceuticals. Moreover, the presence of last generation synchrotron facilities as MAX IV (Lund, Sweden) will definitely bring the research in these areas beyond the limitations faced nowadays.

This is the first in a series of courses with a goal to educate and enlarge the user base from industry and academia to utilize the potential of Big Science facilities like MAX IV and the interdisciplinary research at Lund University. Let experts from MAX IV, mediator companies and universities help you to learn more about how you can perform an investigation in practice; from the first contact, to measurement, analysis and interpretation of results.

Despite of synchrotron light being a very powerful source to help understanding formulations, it is still not broadly used due to limitations in several steps of the measurement process, i.e. sample preparation, measurement planning and data interpretation. To understand what information can be obtained when using synchrotron light for the characterization of formulations, to know how to proceed for performing the most optimal and fruitful experiment in a synchrotron and to interpret the results is key to make the best use of these methods, which will undoubtedly lift formulation research, production and development activities up to much higher standards.

Small-angle X-ray scattering (SAXS) and X-ray powder diffraction

(XRPD) are key tools to support research, development, manufacturing and life cycle management activities for pharmaceuticals, food and aroma compounds, cosmetics, pigments, catalysts, cement. Typical applications in formulation include:

- Structural changes of formulations in the presence of additives
- Self-assembly of surfactants and polymers
- Material Characterization for QbD – excipients and ingredients
- Gel network microstructure and stability
- Fingerprinting of compounds
- Quantification of impurities

FIND ANSWERS TO YOUR QUESTIONS

The aim of the course is to answer the questions: “Is synchrotron light useful to get a better understanding of my formulation? If so, how should I perform an experiment if I am not familiar with these methods?” Thus, this course will provide participants with the understanding of the key information obtained by using synchrotron light to better understand a solid or liquid formulation.

Characterizing formulations using synchrotron light is somehow like a puzzle consisting of different pieces, i.e. industrial users, local contact at the synchrotron, sample preparation, measurement planning, and data interpretation. In order to put these pieces together, the course will describe the ecosystem that surrounds



MAX IV Laboratory, including the actors that are present to help industry to make the best use of such state-of-the-art large-scale infrastructure. Thus, contributions from two mediator companies will show how the different pieces of the puzzle are put together and how this benefits the industrial community within formulation science. For those who are interested there is a possibility to add an extra half-day – The Formulation Day – for individual meetings with scientists within chosen areas of interest.

"There is a barrier in the use of synchrotron light for many potential industrial users. To overcome this situation, industry very often makes use of mediator companies, which provide the strong scientific and experimental expertise to plan and perform the measurements, as well as to analyse and interpret the data. In many cases, the results obtained using synchrotron light must be complemented by the use of other methods, i.e. from theoretical simulations all the way to consumer panels. Mediator companies are definitely the bridge to connect all these pieces and are key to add value, which at the end provides a unique benefit to the industrial community."

Anna Stenstam, CEO of CR Competence AB

COURSE OUTLINE

This is an intensive two-day course including hands-on, which will be held in English at MAX IV Laboratory. The course has a focus on the interaction between industry interested in obtaining an insight into characterization of formulations and last-generation synchrotrons as MAX IV. The course will be a mix of lectures, including basic background information about methods and examples relevant to formulation science and a panel discussion.

A central activity of the course will be to perform hands-on experiments on state-of-the-art laboratory instrumentation, which will provide the participants with a practical experience on how to perform a scattering/diffraction experiment and which results can be obtained using such methods. In addition, the course will include a visit to the MAX IV Laboratory infrastructure. The participants will thus have the opportunity to get an overview on how they can make use of and benefit from synchrotron light within the field of formulation science. It also gives an opportunity for the participants to exchange experience with other attendants and lecturers as well as nurture or strengthen their network.

The course is intended to focus on the challenges that participants

are facing today. Thus, the attendees will be asked to submit questions and their own problems prior to the start of the course, which will be highlighted during the course. The Formulation Day provides a further possibility for deeper discussions with experts. The Formulation Day will be tailored for each participant within the scope of the course.

Day 1 (@ MAX IV):

- Basics on scattering (light, X-rays and neutrons)
- X-rays in formulation science
- Examples of the use of SAXS in formulation science
- Synchrotron X-ray Powder Diffraction (XRPD)
- Scattering instruments at MAX IV
- Visit to MAX IV facility

Course dinner

Day 2 (@ Kemicentrum):

- Hands-on labs
- Route from questions to results
- Panel session on how to perform a measurement at a synchrotron, key aspects and challenges

WHO SHOULD ATTEND?

This is a course combining science and applications of the use of synchrotron light within formulation science. Thus, it is aimed at R&D Managers, industrial specialists and project leaders at companies, as well as university researchers, who want to learn how they can make use of and benefit from synchrotron light within formulation science.

"For more than 25 years, I have been working at synchrotron facilities in close collaboration with industry. Thanks to the characteristics of the synchrotron source, high photon beam intensity and tunable photon energy, synchrotron X-ray scattering and XRPD are virtually applicable to any kind of materials. The high brightness of synchrotron radiation sources enables X-ray characterization of pharmaceutical products and chemical compounds with a quality much superior to that achievable with lab-based X-ray sources."

Fabia Gozzo, Founder and CEO of Excelsus Structural Solutions AG



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