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Flow Chemistry Highlights

Flow Chemistry Network

Selected Topic: An Interview with Ben Martin from Novartis, Basel

In a new series of Flow Chemistry Highlights columns, we will share interviews with key people in the field of flow processing in Switzerland. We begin with ***Ben Martin***, who is an organic chemist and continuous manufacturing network leader in process R&D at Novartis Pharma AG, Basel.

Flow Chemistry Network: What brought you to the field of flow chemistry, and what made you stay and contribute to the area?
Ben: I started my involvement in 2007, just as the topic was triggering interest in academia, and particularly in my company. With modest beginnings, we quickly assembled a sizeable team tasked with driving a collaboration with professors at MIT, as well as establishing key reaction classes and projects in-house. Within a few years this snowballed into the construction of a continuous GMP-qualified pilot-plant, able to deliver synthetic processes, their work-ups, and the downstream operations of milling, blending and formulation. As you can imagine, this new area really caught my attention, and I was swept along for this unique journey in our careers.

Flow Chemistry Network: To your mind, what have been the major developments in the field over those years?
Ben: Like all impactful technologies flow chemistry was subject to hype. Looking back, it really did follow the Gartner Hype Cycle curve, with over-expectations, then questions asked as to why it did not deliver the world, and a final steady-state as a mature technology delivering molecules to the market on a regular basis, albeit at lower frequency than initially predicted. The major developments were not only those coming from academic and industrial labs, but also the recognition of this technology by health authority regulators, and we are finally seeing that there is a framework to operate in which won't be a barrier to innovation in commercial processes.

Flow Chemistry Network: What are the exciting innovations in the field today which you think could give it even greater impact?
Ben: So much has been demonstrated already, from the end-to-end continuous synthesis of complex targets in academic labs, to high-volume industrial continuous manufacturing processes running for months without interruption. The new innovations are directly connected to the cutting edges in chemistry, such as biocatalysis and photochemistry, which are coming into the foreground as powerful methods. Taking photocatalysis, flow designs have already been shown to work around many inherent issues like the Beer-Lambert law defining light penetration depth. As the methodology grows, the examples of scale-up in continuous mode will grow too.

Flow Chemistry Network: What should a young researcher/industrial chemist keep in mind when embarking on using flow processing?
Ben: To some extent the hype is ever-present. My recommendation would be to team up with a chemical engineer (or an organic chemist if you are one), and become familiar with cost-calculations and applying green-metrics. If the proposed chemical process doesn't add up in terms of costs or green credentials, then it's unlikely to be attractive to local decision makers

Flow Chemistry Network: Flow chemistry is already being considered as a mature technology. What is left to do to make this a standard tool for chemists?
Ben: What we define as standard is what we have seen many times before. If a bachelors or graduate student hasn't ever seen or heard of a flow device, they will consider it exotic and either find it an attractive curiosity, or more commonly, a risk. We are fortunate to have educators in Switzerland that are starting to bring flow into the curriculum, but it is yet to be commonplace. On the other hand, it is indeed a mature technology in industry, and the wave of adoption in CDMOs means that it isn't even always the client that needs the first impulse to apply this enabling tool.

Would you like to propose a Flow Chemistry Highlight topic here?
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