

Flow Chemistry Highlights

Flow Chemistry Network

Introducing a new CHIMIA column

Introducing the Flow Chemistry Network

Benjamin Martin*, Claudio Battilocchio*, Agnieszka Ladosz*

*Correspondence: Dr. B. Martin, E-mail: Benjamin.martin@novartis.com, Novartis; Dr. C. Battilocchio, E-mail: Claudio.Battilocchio@syngenta.com, Syngenta; Dr. A. Ladosz, E-mail: agnieszka.ladosz@idorsia.com, Idorsia Pharmaceuticals Ltd

How It All Started

At the beginning of 2018, a small group of industrial colleagues passionate about flow chemistry, started to discuss the opportunities of creating a diverse community within which to share their views and understanding of the technology. The so-called ‘Basel Flow Chemistry Network’ was established between Syngenta, Idorsia, Givaudan and Roche, and pre-competitive exchanges on best practices could begin in this rapidly-evolving field.

As most of you will know, *flow processing* is an important component of the modern chemist’s toolbox, which is reflected in the large number of publications and patents deriving globally from both academia and industry. Known under various guises (*i.e.* continuous manufacturing; flow chemistry) and with various focal points (*i.e.* upstream and downstream, including continuous separation processes), the Swiss chemical community has been a long-time contributor to the field of flow chemistry. However, one should admit that despite the continuous advances in the field and the larger uptake from the global community, there is still an intrinsic resistance to embedding the technology as a standard tool rather than considering it just an *avant-garde* alternative.

Flow chemistry uses continuous, rather than iterative batch operations, to perform chemical processes and separations. Reagents are continuously pumped through a reactor and the product is collected continuously at the reactor outlet. The smaller dimensions and ability to work under pressurized conditions can enable safer, more controlled syntheses, while also shortcutting synthesis schemes and rendering scale-up more predictable, amongst other benefits.

While continuous processing is ubiquitous in bulk chemical industry, it is thanks to the advancement of micro-reaction technology that it has been only relatively recently embraced by other chemical industries.

Aware of these pre-conditions, in addition to technical exchanges, the Basel Flow Chemistry Network made the clear aim to inspire and make more accessible the opportunities the technology offers to a wider national community.

In 2020, a series of interactions between the Basel Flow Chemistry Network and the Executive Board Members of the Swiss Chemical Society led to the decision to open up the Basel Flow Network to both academia and industry in all of Switzerland,

and so a Swiss network was created for the first time which could act in unison under the common umbrella term of ‘Flow Chemistry Network’, hosted generously by the Swiss Chemical Society. The first step was made during the ILMAC event in Lausanne, when on the October 7th, 2020, the community was formally established during a workshop, intended to map our backgrounds, visions and concrete goals of the broader group (Fig. 1).

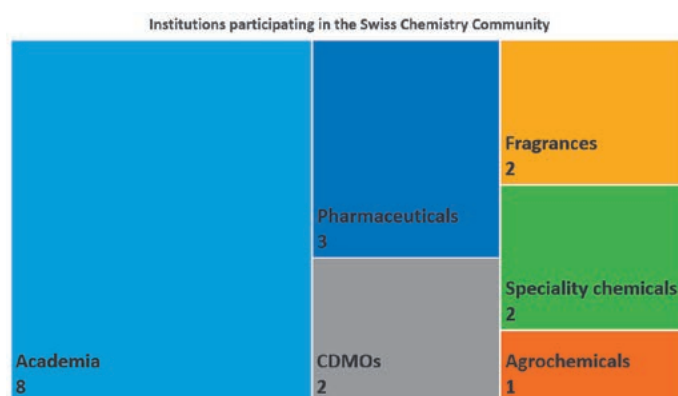


Fig. 1. Strength in diversity: the backgrounds of our members across the Flow Chemistry Network.

Mission Statement & Community Values

The ILMAC workshop allowed our new community to identify a shared vision, outlining the values which characterize our group (Fig. 2).



Fig. 2. Values of the Flow Chemistry Network (*i.e.* Innovate; Educate & Communicate; Collaborate).

The values defined during the workshop are also clearly reflected in the mission statement: *To shape the future of our society through our values, and accelerate advances in flow chemistry.*

Considering the diverse topics in flow chemistry, and the personal imperatives of each community member and institution, we also asked ourselves a fundamental question:

‘How would we each define our dream application of flow chemistry?’

Based on the keywords contributed by individual core and extended members we can illustrate this in the following word-cloud. The boldest applications will be taken forward as our dominant themes (Fig. 3).



Fig. 3. The dream applications of flow chemistry according to the core and extended board.

With a grounded mission, value system and a view on our ideal applications we can share with you some of our projects for the upcoming years under the aegis of the Swiss Chemical Society.

In 2021 we will organize a flow chemistry symposium, to take place at the ILMAC in Basel in the autumn (19th October). Speakers will be invited from academia and industry to share on the topics of intensification and sustainability. Regarding educa-

tion, a working group has been established to prepare a curricula for the teaching of flow chemistry theory and practice at universities. Education efforts will be invaluable in raising awareness of this mature field, especially since flow topics are still rarely taught outside of chemical engineering programs. In connection, we plan to hold seminar retreats for PhD students studying at Swiss institutions, although dates for this are not yet set.

Finally, we will be maintaining a column in CHIMIA dedicated to flow chemistry topics, covering announcements on upcoming activities, and covering the literature developments in brief synopses titled ‘Flow Chemistry Highlights’.

We look forward to exchanging with the wider Swiss Chemical Society community, and are enthusiastic to support this valuable field through our collaborative effort.

Core team (Board)

Claudio Battilocchio, Syngenta (Chair)	Joerg Sedelmeier, Roche
Agnieszka Ladosz, Idorsia	Marc-Andre Mueller, DSM
Jacques Membrez, Givaudan	Benjamin Martin, Novartis
Nina Hartrampf, UZH	Roger Marti, HEFR
Francesca Paradisi, UniBern	
Christof Sparr, UniBasel	

Extended Board

Flavien Morel, Firmenich	Kurt Puentener, Roche
Benjamin Otter, Syngenta	Dominique Roberge, Lonza
Stefan Brand, Clariant	Maurus Marty, DSM
Fridtjof Schroeder, Givaudan	Peter Riedlberger, ZHAW
Jerome Waser, EPFL	Andrew deMello, ETH
David Linder, Roche	Jeffrey Bode, ETH
Guenter Weingaertner, Dottikon	

Received: February 26, 2021