



## Flow Chemistry Highlights

### Flow Chemistry Network

Selected Topic: An Interview with Francesca Paradisi



In this month's Flow Chemistry column, we are happy to hear from **Francesca Paradisi**, Professor of Sustainable Pharmaceutical Chemistry at the University of Bern.

**Flow Chemistry Network:** What brought you to the field of flow chemistry, and what made you stay and contribute in the area?

**Fran:** My discovery of flow was very fortuitous, and I remember it very well. Dr. Charlotte Willans from the University of Leeds gave a talk in UCD in Ireland where I was at the time (around 2016) and showed how flow reactors were very beneficial in her research. I thought: "we have been working with immobilized enzymes for years, maybe we can pack a reactor and see if we can get the same benefits with continuous biotransformations". It was a major turning point in our research and the range of possibilities that flow offers are incredible. We evolved over the years from initially very simple systems to more complex and ambitious multi-step processes, with great attention to downstream treatments, recovery and reuse of unreacted reagents *etc.*, and we are still great supporters of flow strategies.

**Flow Chemistry Network:** To your mind, what have been the major developments in the field over those years?

**Fran:** In our specific field of flow biocatalysis, it has been great to see many more colleagues adopting flow technologies for a variety of systems, I would say that the major developments have been towards a much more integral approach to the overall flow reaction set up, with great attention to waste, the implementation of cascade reactions, as well as mixed chemo-biocatalytic systems.

**Flow Chemistry Network:** What are the exciting innovations in the field today which you think could give it even greater impact?

**Fran:** In my opinion, in-line monitoring of reactions and the development of AI to rapidly optimize the reaction conditions in flow will eventually become the common approach in the field. Now I think most researchers will still try first a reaction in batch before the move to flow, but maybe this will become eventually redundant.

**Flow Chemistry Network:** What should a young researcher/industrial chemist keep in mind when embarking on using flow processing?

**Fran:** Oh, I say this all the time, we must keep in mind that flow chemistry is still just a tool, the purpose remains the achievement of the product in high yield efficiently and sustainably. Sometimes flow is not the best solution and there is the urge to try and make it work, complicating the system unnecessarily. If your flow set up is overly complex, probably it will not be very applicable. Maybe batch is the best option, no offense taken!

**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 and chemical engineers?

**Fran:** My hope is that the versatility of the flow technology will be key in making biocatalysis more easily integrated into classic multi-step synthetic strategies and therefore increase the development of enzymatic reactions in industry because perhaps it will not require a full redevelopment of a plant, but just the substitution of a reactor. So for me what is still a bit in its infancy is the ease of switching between different solvent systems, the problem of dilutions when we add more inlets, or the compatibility of different reaction conditions.

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

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