Biography

Timo Beskers‘ career in polymer chromatography started with his master thesis at Karlsruhe Institute of Technology in 2010. He obtained his PhD in 2014 on the topic of chemically sensitive detectors for size exclusion chromatography (SEC), working with SEC, infrared spectroscopy and QCL lasers, a technique he was introduced to during a research internship with Prof. B. Lendl at TU Vienna in 2012. Timo Beskers extended his knowledge of fractionation techniques when working with field flow fractionation during his postdoc with Prof. H. Pasch at Stellenbosch University, South Africa in 2015 and 2016. Thereafter, he started working for PSS Polymer Standards Service GmbH, a company specialized in SEC, extending his expertise in polymer analytics from an industrial viewpoint. He is now working for BASF, leading an SEC laboratory. His research interest lies in method development for polymer analytics with a special focus on two-dimensional or coupled techniques as well as SEC for regulatory requirements: complying with OECD, DIN or ISO guidelines under GLP or as a preparation for Polymer-REACh.

Polymer REACh: Pray or be Prepared? A Polymer Chromatography Viewpoint on What to Expect

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Polymers are large molecules, composed of similar or identical repeating units, called monomers. Due to the nature of their synthesis, polymer materials show distributions in many properties, of which molecular weight is the most important one. Whilst measuring a (broad) range to get information about the distribution instead of determining a single value often poses an analytical challenge, it is exactly these distributions which allow polymers to have many different, very versatile properties and be fine-tuned for their specific application. That is – together with the ease of production – why polymers are ubiquitous and essential to the life we know today.

The omnipresence of polymers comes with downsides, which often appear beyond their intended purpose. Polymers are used so frequently in everyday life, that they constitute a significant part of global waste production: directly post lifetime, but also through abrasion and breakage for example. Not only the polymer itself but also side components and impurities in the polymer materials can be released into the environment. This has become a grave concern globally, and actions are being taken to mitigate or prevent this. The European Commission included polymer risk assessment as a focus area in its Green Deal and a legislation package called Polymer REACh (PREACh) is expected to be put into force in 2026. These developments will more than likely have a huge impact on the European polymer market. The registration of polymers is expected to become a complex process, as a lot more analytical data is required. To date only limited details are known regarding these requirements, but what can the polymer industry expect and what should analytical laboratories prepare for?

The molecular weight distribution (MWD) will be one key characteristic, which will be required early in the registration process. The MWD needs to be analysed by size exclusion chromatography (SEC or GPC), which is applicable to many, but not all polymers. In a similar way, for other required properties there is no universal method that can be applied to all polymers. For some methods, like water solubility, the molar mass dependency does not allow the transfer of known methods for small molecules directly to polymers. It is a challenge to find or develop suitable methods for polymers, which also fulfil the regulatory requirements for an analytical method.

The problem at hand is the very individual nature of polymer materials often requiring individual analytics. On the other hand, there's a regulatory need for standardized, fast, universally applicable, and robust methods to be used in the PREACh registration process. These conflicting requirements pose very big challenges for the polymer analytics community.

In this talk, we will provide an overview about what is known and what can be expected from Polymer REACh, as well as provide a more detailed look at what this means for analytical chemists in general and polymer chromatography in specific.