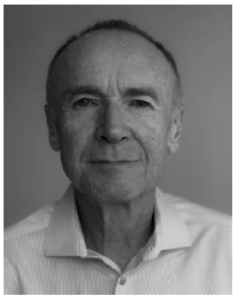
10th October 2019, 11 a.m.
Conference hall of ISPM RAS

Open lecture on the topic:

SEC and FFF with Advanced Detectors for the Characterization of Natural and Synthetic Polymers



Lecturer:
Stepan Podzimek, Professor,
University of Pardubice, Polymer Chemistry Department

Language: English

This seminar provides a comprehensive overview of polymer characterization using Light Scattering:

- **Characterization of polymers: molar mass, conformation, branching**
- **Theory of Light Scattering**
- **Application examples SEC-MALS (including differential Refractometer, online differential viscometer) and FFF-MALS (Asymmetrical Flow Field Flow Fractionation as alternative to SEC)**
- **Copolymer Analysis**

Only multi-angle light scattering (MALS) can determine the absolute molar mass and size distributions of heterogeneous polymers independently of retention time and molecular standards, and regardless of non-ideal column interactions. That's because MALS measures molecular weight and rms radius (a.k.a. radius of gyration) directly from first principles. All that is needed is a convenient means of size-based separation preceding the on-line MALS detector.
Couple a MALS detector and a refractive index concentration detector to a size exclusion chromatography (SEC) or gel permeation chromatography (GPC) system to create a SEC-MALS absolute characterization tool for polymers. Wyatt detectors interface with HPLC systems from all major vendors.
For more advanced separation capabilities consider the advantages of field-flow fractionation coupled to MALS detectors – FFF-MALS. FFF systems separate nanograms to milligrams over sizes from 1 to 1000 nm, without shear or non-ideal column interactions.

Branching ratio of polymers is determined through the relationship between molar mass and size; both are determined simultaneously and independently via multi-angle light scattering coupled to size exclusion chromatography (SEC-MALS) or field-flow fractionation (FFF-MALS).
Molecules smaller than 10 nm in radius require a differential viscometer to determine size or else a dynamic light scattering module embedded in the MALS detector for size measurements.
Multi-Angle Light Scattering in combination with UV and RI detection system may be used for characterizing Co-polymers. Given known polymer responses to each of the two concentration detection signals it is possible to calculate the ratio of concentrations of the two; this information is combined with the MALS signal to determine the molar mass of each polymer in the complex.

The second part of the seminar will be devoted to the results of the study of biodegradable star-shaped polylactides synthesized in the laboratory of functional polymer structures of ISPM RAS.