



University
of Basel

Department of
Biomedical Engineering



Seminar Series:

Latest Breakthroughs in Biomedical Engineering Research

Location: DBE Science Lounge, Hegenheimermattweg 167C, 4123 Allschwil

Date & Time: Thursday 16.04.2026 | 16:30 – 17:30

Host: Prof. Pablo Sinues

Sensing the Invisible: Optical & MS-based Gas Monitoring

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Abstract

Detecting trace gases in real-time is crucial for everything from air quality and industrial safety to medical breath analysis and fruit storage. Many gases possess unique "fingerprints" in the mid-infrared (mid-IR) spectrum, allowing laser-based absorption spectroscopy to identify and quantify specific molecules with extreme precision. These optical tools are moving from specialized labs into the field, providing a real-time window into complex chemical environments.

To fully capture the "invisible chemistry" around us, optical methods are increasingly complemented by Mass Spectrometry (MS). Technologies such as PTR-ToF-MS offer an untargeted approach, capable of detecting a vast range of volatile organic compounds (VOCs) simultaneously with sub-parts-per-billion sensitivity. By combining the molecule-specific reliability of laser sensing with the comprehensive screening power of PTR-ToF-MS, we can achieve a multi-dimensional view of gas dynamics. This presentation explores these synergistic technologies and their applications across environmental and life sciences, moving us toward a more complete understanding of the air we breathe.

Biosketch

Dr. Simona Cristescu is the head of the Trace Detection Laboratory (TDLab) at Faculty of Science, Radboud University, the Netherlands, and the chair of the International Association for Breath Research (IABR). With over 25 years of experience in gas sensing, she pioneered laser-based spectroscopy for detecting volatile compounds in complex mixtures.

Her group develops cutting-edge analytical technologies including mid-infrared systems for multispecies gas detection and high-resolution mass spectrometry for comprehensive gas analysis. Her work addresses emission reduction, environmental monitoring, health diagnostics, and energy transition through real-time chemical detection and process control.