Ortsverband Freiberg
Die Vorsitzende / Prof. Dr. Carla Vogt
Tel. (03731) 39 3468

GDCh-Kolloquium am 11.11.2026

TU Bergakademie Freiberg, Lessingstraße 45

16:15 Uhr, Lessingstr. 45, LES-1001



Prof. R. Zimmermann

Chair of Analytical and Environmental Chemistry &
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100 Years of Photoionization: Principles of photoionization mass spectrometry and current applications

Theoretical and physical descriptions of the nature of light and matter in the late 19th and early 20th centuries were rapidly followed by the rise of mass spectrometry (MS) as a powerful analytical technology. Expanding upon studies of the photoelectric effect in the 1920s, F. L. Mohler developed a photoionization (PI) source in 1926, which was later integrated into photoionization mass spectrometry (PIMS). With the advent of lasers in the 1960s, further light-based ionization techniques emerged, including resonance-enhanced laser ionization, laser desorption/ionization (LDI), and ultimately matrix-assisted laser desorption/ionization (MALDI).

On the occasion of this 100th anniversary, this lecture begins with a brief history of photoionization processes, specifically single-photon ionization (SPI) and laser-based resonance-enhanced multiphoton ionization (REMPI), followed by an introduction to the fundamental principles of photoionization. The main part of the lecture will focus on the concepts, technical developments, and practical implementations of analytical PIMS (classical SPI and REMPI) for real-world applications. These range from online threat detection (e.g., traces of explosives or fuels in seawater) at World War II wrecks or ammunition dumpsites using ship-based or submersible membrane-inlet PIMS systems, to industry-relevant monitoring applications (e.g., coffee roasting and catalytic processes), and finally to recent developments in atmospheric and aerosol research.

In the context of atmospheric and aerosol science, the integration of resonance-enhanced photoionization processes into single-particle mass spectrometry (SPMS) will be highlighted. This approach enables the rapid online detection of trace metals and the molecular profiling of polycyclic aromatic hydrocarbons within individual airborne aerosol nanoparticles. Recent applications of this resonance-enhanced PIMS methodology in atmospheric science will be presented and discussed.

Interessenten sind herzlich willkommen!

Prof. Dr. C. Vogt
Ortsverbandsvorsitzende

GDCh
Gesellschaft Deutscher Chemiker

Prof. Dr. G. Frisch
Fakultätsdekan