

## VA 2: Vacuum Metrology

Time: Monday 9:30–12:15

Location: H6

**Invited Talk**

VA 2.1 Mon 9:30 H6

**Vacuum metrology and its impact on research and industry** — ●KARL JOUSTEN and MATTHIAS BERNIEN — Physikalisch-Technische Bundesanstalt, Institut Berlin, Abbestr. 2-12, 10587 Berlin

Whenever a physical quantity like vacuum pressure is being measured it is important that the indication of the instrument is in agreement with the International System of Units (SI). Normally, the user does not want to take care of this, but the manufacturers of the instruments and the calibration services need to. The measurement of vacuum covers 15 decades and needs instruments that realize quite different physical effects of pressure or gas density. While the mechanical deformation of membranes or thermal conductivity are used in rough and medium vacuum, the instruments for high and ultra-high vacuum measure the impingement rate of gas molecules or their number density in some volume. Vacuum presents the necessary environment for many research activities and industrial processes, however, just a few applications need high accuracy of the vacuum measurement. Leak rate measurements or outgassing rate measurements have to ensure that components are correctly qualified for their purpose as e.g. cardiac pacemakers or components in EUV lithography. In the future, it can be expected that optical methods like laser spectroscopy and refractive index measurements will play a more important role in vacuum measurement.

VA 2.2 Mon 10:10 H6

**Vacuum-compatible photon-counting hybrid pixel detector for WAXS, XRD and XRR in the tender X-ray range** — ●DIETER SKROBLIN<sup>1</sup>, LEVENT CIBIK<sup>1</sup>, BENJAMIN LÜTHI<sup>2</sup>, SWENJA SCHREIBER<sup>1</sup>, MAXIMILIAN LUTTKUS<sup>1</sup>, ALEXANDER SCHAVKAN<sup>1</sup>, MIKA PFLÜGER<sup>1</sup>, and MICHAEL KRUMREY<sup>1</sup> — <sup>1</sup>Physikalisch-Technische Bundesanstalt (PTB), Abbestraße 2-12, 10587 Berlin, Germany — <sup>2</sup>DECTRIS Ltd., Neuenhoferstrasse 107, 5400 Baden, Switzerland

A vacuum-compatible photon-counting hybrid pixel detector has been installed in the UHV reflectometer of the four-crystal monochromator beamline of the Physikalisch-Technische Bundesanstalt (PTB). The setup was developed in cooperation with Dectris Ltd. and is based on the PILATUS3 100k module. The quantum efficiency, homogeneity, angular dependence and linearity of the new detector have been investigated. First results of the performance in wide-angle X-ray scattering (WAXS), X-ray diffraction (XRD) and X-ray reflectometry (XRR) are presented.

**15 min. break**

VA 2.3 Mon 10:55 H6

**Vacuum Pressure Measurement in Industrial Environments** — ●MARTIN WÜEST — INFICON AG, Alte Landstrasse 6, LI-9496 Balzers, Liechtenstein

The theme of this session is "Metrology is the key for your success in research and industry". Indeed poor process control leads to large

product tolerances, commonly associated with low product quality. However, the word "metrology" is more often associated with National Measurement Institutes (NMI) than with industrial practice. At NMI we have benign conditions with a clean environment, temperature stability, knowledgeable personnel and plenty of time for a thorough calibration. The industrial world is different. We have seasonal and daily ambient temperature swings, we have vibration, magnetic interference, harsh process chemistries and the like. Time is money; therefore high cadence process steps are favored. To bring the science of measurement to industry is a challenge. Sensors are expected to reliably and reproducibly measure process variables in a non-ideal environment. I will present cases demonstrating what we had to do to make our vacuum gauges better withstand the real industrial world.

VA 2.4 Mon 11:25 H6

**Absorption spectroscopy for process monitoring of technological plasmas** — ●JÜRGEN RÖPCKE, MARIO HANNEMANN, SARAH-JOHANNA KLOSE, NORBERT LANG, ALEXANDER PUTH, and JEAN-PIERRE H. VAN HELDEN — Leibniz Institute for Plasma Science and Technology, Greifswald, Germany

Mid infrared absorption spectroscopy (AS), based on quantum cascade lasers (QCLs) has progressed considerably as a powerful diagnostic technique for in situ studies of molecular plasmas. The increasing interest in processing plasmas containing molecular precursors has led to further applications of QCLAS because most of these compounds and their decomposition products are infrared active. QCLAS provides a means of determining the absolute concentrations of the ground states of stable and transient molecular species, which is of particular importance for the investigation of reaction kinetics. Since plasmas with molecular feed gases are used in many applications such as thin film deposition, semiconductor processing, surface activation and cleaning, and materials and waste treatment, this has stimulated the adaptation of infrared spectroscopic techniques to industrial requirements. The recent availability of frequency combs as new radiation sources for MIR-LAS will open up completely new options in process monitoring.

VA 2.5 Mon 11:55 H6

**Nothing without vacuum!** — ●UTE BERGNER — Deutsche Vakuum Gesellschaft (DVG)

Vacuum technology plays an important role in the progress of major industries. The rise of many applications enabled only by the use vacuum in the 20th century lead the foundation of vacuum societies. The roots of the German Vacuum Society founded in 1963 go back to the 1950s when physicists, engineers and others founded several organizations in order to exchange experiences and knowledge in the field of vacuum technique and physics. More than ever, vacuum technology is an essential enabler of high technologies and advances many fields of research. The talk gives an insight into the aims and activities of the DVG, its collaboration and interaction with the DPG, the IUVSTA and networking opportunities with industry.