

NEVAC-dag 2026 – Sprekers en abstracts

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Senior Mass Spectrometry Scientist - Leak Detection Tools, Inficon

Cleanliness Matters: Engineering a Production Line for High-End Quadrupole Mass Spectrometers

Quadrupole mass spectrometers sit at the heart of trace gas analysis and process monitoring across UHV research and demanding semiconductor applications. As performance requirements push toward lower detection limits, drift-free operation, and faster acquisition speed, contamination control during manufacturing is a critical element.

This talk takes the audience inside the engineering of a quadrupole MS production line and shows how cleanliness shapes – and limits – real-world instrument performance. Using Inficon's Quadrupole product families (QMG and MPH), it is discussed what 'clean enough' actually means, where the dominant contamination sources sit, and which design and process choices keep parts clean from raw material through final test.

The presentation closes with practical lessons learned from ramping up a new production line, including unexpected contamination paths and what they implied for both the manufacturing process and the user community in UHV research and semiconductor manufacturing.

Matthias Bernien

Werkgroepleider Vacuum Metrology, PTB

Advances in traceable vacuum and outgassing rate measurements

The reliability of quantitative pressure and outgassing rate measurements in vacuum is a prerequisite for many industrial and scientific applications. Accuracy is ensured through a chain of calibrations relating it to a primary standard at a national metrology institute. This presentation will provide an overview on the advances of PTB's Vacuum Metrology Group both in reducing the uncertainty of primary pressure realisations in the vacuum regime and in improving the reliability of transfer standards for pressure and outgassing rates.

In the pressure range from 10 mPa to 1,300 Pa, a fully automated static expansion system made of aluminium has been set up and validated. Its principle involves transferring a fixed amount of gas from a smaller volume to a larger one, creating a well-defined lower pressure, provided that the initial pressure and the volume ratio are accurately known. Relative standard measurement uncertainties between 0.08% and 0.012% are achieved.

Primary standards based on cold atom traps promise a new route to the realisation of the Pascal in the ultra-high vacuum range by measuring the loss rate induced by collisions with gas molecules. To establish such standards, comparisons with conventional standards must be carried out to validate their working principle.

In the semiconductor industry, the outgassing of components in vacuum must be well controlled. These contaminants are monitored using quadrupole mass spectrometers (QMSs). However, a quantitative measurement of the amount of contamination is challenging as QMSs inherently lack stability. To improve the comparability of outgassing rate measurements, PTB together with IMT and industrial partners has developed outgassing rate reference samples for dodecane and water.

Niels Hoogendoorn

Promovendus, TU Eindhoven

Van materiaalonderzoek tot toepassing op Li-anodes

Lithium-ionbatterijen zijn een veelbelovende technologie om fluctuaties in zonne- en windenergie op te vangen. Hun prestaties worden echter beperkt door degradatieprocessen aan het grensvlak tussen elektrode

en elektrolyt. Wij onderzoeken hoe atoomlaagdepositie (ALD) deze uitdagingen kan helpen oplossen. Met ALD kunnen we ultradunne, kunstmatige grensvlaklagen met atomaire precisie aanbrengen, wat mogelijk leidt tot verbeterde stabiliteit, verkorte formatiecycli (de eerste laad- en ontladcycli van een batterij waarbij een stabiele grensvlaklaag wordt gevormd) en een langere levensduur.

Patrick Werneke

Senior engineer bij Nikhef en hoofd van de Engineeringafdeling van de Einstein Telescope Organisation

Vacuïmuitdagingen voor de Einstein Telescope

De ondergrondse Einstein Telescope (www.einsteintelelescope.eu) moet Europa's meest geavanceerde observatorium voor zwaartekrachtsgolven worden. Daarmee kunnen onderzoekers extreem kleine trillingen meten van onder meer botsende zwarte gaten en zo nieuwe inzichten verkrijgen over het zeer vroege heelal. De extreem hoge meetnauwkeurigheid maakt de telescoop echter bijzonder gevoelig voor externe trillingen en verontreiniging in de detector. In deze presentatie worden het ontwerp en de werking van de Einstein Telescope besproken, alsmede de redenen voor en technologische uitdagingen van het realiseren van het ultrahoge vacuüm (UHV).

Timo Huijser

Research engineer vacuümsystemen, TNO

RGA: naar een hogere nauwkeurigheid in gasanalyse

Restgasanalyse (RGA) wordt veelvuldig toegepast voor kwalitatieve analyses zoals lekdetectie en contaminatie-onderzoek binnen vacuümsystemen. Het nauwkeurig bepalen van gassamenstellingen en de bijbehorende partiële drukken vormt echter een grote uitdaging, met name bij relatief hoge gasdrukken. Klanten van TNO stellen vaak hogere eisen aan de nauwkeurigheid dan standaard RGA-systemen kunnen bieden. Om aan deze behoefte te voldoen, ontwikkelt TNO verbeterde RGA-metrologie door optimalisatie van instellingen en meetmethoden, én door modellering van de ionenbron om te corrigeren voor chemische en fysische artefacten. Deze presentatie licht de uiteenlopende werkzaamheden toe op het gebied van RGA binnen TNO, afdeling Semiconductor Equipment Metrology, in Delft.

Roland Bliem

Groepsleider Materials and Surface Science for Extreme Ultraviolet Lithography bij ARCNL en universitair hoofddocent aan de UvA

At the Interface of EUV Lithography and Plasma Catalysis

For latest-generation nanolithography for chip manufacturing as well as plasma-assisted catalytic conversion, selected materials are exposed to plasma conditions, characterised by highly reactive species. These often experience a lower barrier for interactions at surfaces, which can, for example, enhance catalytic reactions and facilitate plasma-assisted cleaning, thus preventing oxidation and carbon build-up during exposure to ionising radiation in extreme-ultraviolet lithography (EUVL). The accurate prediction of surface reactions in plasma requires in-depth knowledge of the active state of the surface and its evolution in plasma.

At ARCNL, surface reaction mechanisms in the plasmas of EUVL and plasma catalysis are unravelled, untangling the interactions of surfaces with the 'zoo' of reactive species by combining in-situ photoelectron spectroscopy in plasma-activated environments with optical emission spectroscopy and residual gas analysis. Copper, for example, is a promising material regarding resistance to the hydrogen plasma of EUVL, while also being considered as the prime candidate for plasma-catalytic hydrogenation of CO₂ to valuable fuels such as methanol. Upon exposure to plasma-activated N₂, a common trace gas in EUVL set-ups, Cu(111) surfaces are covered with a disordered monolayer of adsorbed nitrogen. In hydrogen, the metallic state of the surface is restored, leaving a small fraction of reacted nitrogen behind. In CO₂-rich plasma for hydrogenation, on the other hand, the Cu(111) surface remains terminated by an oxidised layer. Tracking the individual steps of oxidation and reduction processes allows identification and characterisation of a non-equilibrium Cu(I) phase as a relevant termination for Cu-based plasma catalysis.