

VA 5: Vacuum Measurement in Technical Applications

Time: Monday 15:25–17:05

Location: H6

Invited Talk

VA 5.1 Mon 15:25 H6

Outgassing rate measurements in practice: feasibility and comparability — ●MICHAEL FLÄMMICH¹, FRANCISC HAIDU¹, CHRISTIAN WORSCH¹, MARCEL KLESSEN², KLAUS BERGNER¹, and UTE BERGNER¹ — ¹VACOM Vakuum Komponenten & Messtechnik GmbH, Germany — ²TREAMS GmbH, Germany

Outgassing rate measurements have long been utilized for the qualification of the vacuum suitability of materials in laboratories worldwide. At VACOM these measurements are fully integrated in the process chain of the production and cleaning of vacuum components. By this means, outgassing rate measurements are routinely performed with residual gas analysis (RGA) systems (utilizing either the throughput or the box-in-box method) in order to verify the cleanliness of the parts, components and assemblies. In order to perform reliable, comparable and quantitative RGA measurements utilizing different RGA systems/tools, each system/tool itself needs to be calibrated, where the calibration or rather the adjustment of the utilized quadrupole mass spectrometer (QMS) is finally tipping the scales.

In this talk, we present some results of a comparison of different types of commercially available QMS that have been investigated with respect to their feasibility in qualitative and quantitative outgassing rate measurements. Although these QMS exhibit relevant differences in design (e.g. ion source, single-/double-/triple-filter, rod system, ...) that yield serious differences in their characteristics (e.g. dynamic range, (mass specific) sensitivity, detection limit, ...), it was possible to adjust these QMS to a comparable performance in RGA measurements.

VA 5.2 Mon 16:05 H6

Improved model for transmission probabilities of edge-welded bellows based on TPMC simulations — ●MARCEL KRAUSE and JOACHIM WOLF — Karlsruhe Institute of Technology (KIT), Wolfgang-Gaede-Str. 1, 76131 Karlsruhe, Germany

Edge-welded bellows are a frequently used component of many complex vacuum systems. Simulating these bellows in the regime of molecular flow with a Test Particle Monte Carlo (TPMC) algorithm is often time-consuming and CPU-intensive. By investigating the change of

the transmission probability of bellows in comparison to cylindrical tubes for a large range of geometry parameters of both the bellows and the tubes, we developed an empirical model for the transmission probability of edge-welded bellows. This new model allows to replace edge-welded bellows in TPMC simulations with cylindrical tubes with an effective length to account for the transmission probability of the bellow. We found that the replacement of a bellow with a cylindrical tube decreased the simulation time by factors up to 1000, while the error introduced through the replacement was in most cases negligible.

VA 5.3 Mon 16:35 H6

Modern Mass Spectrometry in Vacuum Applications using LEYSPEC RGAs — ●STEFAN LAUSBERG — Leybold GmbH, Bonner Str. 498, 50968 Köln, Germany

In vacuum applications it is essential to keep the process or ultimate pressure at a distinct level. For some cases it is sufficient to consider the total pressure. However, in many vacuum applications it is even more important to keep the partial pressure of a certain substance at a distinct threshold. Parts treated in vacuum furnaces are very sensitive to enhanced amounts of oxygen. Optical thin film production requires a low enough partial pressure of water and the absence of hydrocarbons. This is where residual gas analyzers (RGA) come into play.

Here we present the new Leybold RGAs, the so-called LEYSPEC VIEW and LEYSPEC ULTRA. These quadrupole mass spectrometers (QMS) cover a range of atomic masses up to 300 amu. They can be provided suitable for bake-out temperatures of up to 300°C and operation temperatures of up to 250°C. The all-in-one devices with integrated control and display can be operated even without connecting them to a computer. A programmable degas function is implemented for degassing after start or exposure to atmosphere. For more advanced test procedures Leybold provides an intuitive software that can be used as a process gas monitor. Different amounts of atomic masses can be entered into recipes that can be identified by the RGA. We outline the utilization of LEYSPEC RGAs in different vacuum applications and their integration into turbomolecular pumping systems forming stand-alone devices.