VA 2: Vacuum Gauges and Instrumentation

Time: Monday 14:00–15:20 Location: HSZ 105

Invited Talk VA 2.1 Mon 14:00 HSZ 105

Pirani type microsensors for pressure measurements from 10^3 mbar to 10^{-6} mbar — •Mario Grau[1,2], Friedemann Völklein[1], Andreas Meier[1], Christina Kunz[1], Lars Breuer[1], and Peter Woias[2] — [1]RheinMain University of Applied Sciences, Wiesbaden — [2]University of Freiburg, Dept. of Microsystems Engineering

Conventional thermal conductivity vacuum gauges cover a measurement range from typically 100 mbar to 10^{-3} mbar. By miniaturization of such sensors it is possible to significantly expand the sensitivity range. Heat flux to the surrounding gas depends on pressure and should be maximized to achieve high sensitivity, whereas the heat losses by radiation and solid thermal conduction have to be minimized. Design optimization leads to sensors with large area suspended membranes with reduced emissivity for the high vacuum range. In contradiction to this approach, we use small area suspended membranes for the rough vacuum range in order to minimize the required heating power. Furthermore small gaps in the order of 10 micrometers are necessary for the improvement of sensitivity in the rough vacuum range. Therefore,we have developed two specific microchips. The first one (VAC_03) is designed for the pressure range from 10^{-6} mbar to 1 mbar and the second one (VAC_04) for the range from 10^{-3} mbar to 10^3 mbar. The chip size of the VAC_04 is very small (1x1 mm) and can be integrated into the housing of the VAC_03 sensor. We present FEM Simulations of the various heat flux mechanisms, chip design and signal voltage versus pressure for the optimized microchips.

VA 2.2 Mon 14:40 HSZ 105

Comparison of different mass spectrometers for fusion applications — •Katharina Battes, Christian Day, and Volker Hauer — Karlsruhe Institute of Technology (KIT), 76344 Eggenstein-Leopoldshafen, Germany

For fusion applications, like e. g. for analysing tokamak exhaust gases, mass spectrometers could be used. But as the plasma pulses can be short (e.g. about 400 s for ITER), fast responding devices are needed. On the other hand also devices with a high resolution as well as a low detection limit are required, as He and D2 should be separated and small contents of impurities should be detected, respectively.

The fast response time can e.g. be achieved by an autoresonant ion trap mass spectrometer (Brooks 835 VQM), which can determine partial pressures from 1-300 amu in 120 ms. Like this online measurements are possible, but the fast scan time leads to a lack of resolution and sensitivity. Therefore a second device, a high resolution quadrupole mass spectrometer (Balzers GAM 400), is used for accurately determining partial pressures of different exhaust gases. Even He and D2 which both appear at a mass of about 4 amu can be separated and quantified. However, such a scan can only be performed a few times during a short pulse. As third device another QMS (MKS Microvision 2) is going to be tested. It operates only in the mass range from 1-6 amu and there achieves very high resolution.

This paper will present comparative measurements of expected exhaust gases and discuss the applicability of these three devices for online-mass spectrometry.

VA 2.3 Mon 15:00 HSZ 105

Synthesis and investigation of advanced materials based on low-dimensional systems by fast XPS — •Sergey Babenkov[1], Olga Molodtsova[1], Victor Aristov[1,2], Frank Scholz[1], Joern Seltmann[1], Ivan Shevchuk[1], Leif Glaser[1], and Jens Viefhaus[1] — [1]DESY, Hamburg, Germany — [2]ISSP RAS, Chernogolovka, Russia

Generally the synthesis and consequently many properties of advanced materials involve fast reaction processes, which should be precisely controlled and characterized. We propose fast electron spectroscopy for this task. The end-station for such investigations was designed, built up and installed into the soft X-ray beamline P04 at PETRA III (DESY Hamburg). The system is based on a hemispherical electron spectrometer ARGUS (Omicron NanoTechnology) with parallel detection, which in combination with the high brilliance of PETRA III at XUV beamline P04 provides the possibility of taking extremely fast (below 1 sec/spectrum) soft x-ray photoelectron spectra of high quality.

Using such unique set-up first of all we have studied the process of graphene formation by control the time/temperature/rare-gas pressure parameters. In addition we present metal-organic interface formation by in-situ indium deposition onto thin organic molecular crystal (CuPcF4) at room temperature conditions.