Karlsruhe Institute of Technology

Adsorption and Desorption on Cryogenic Mirror Surfaces in Vacuum

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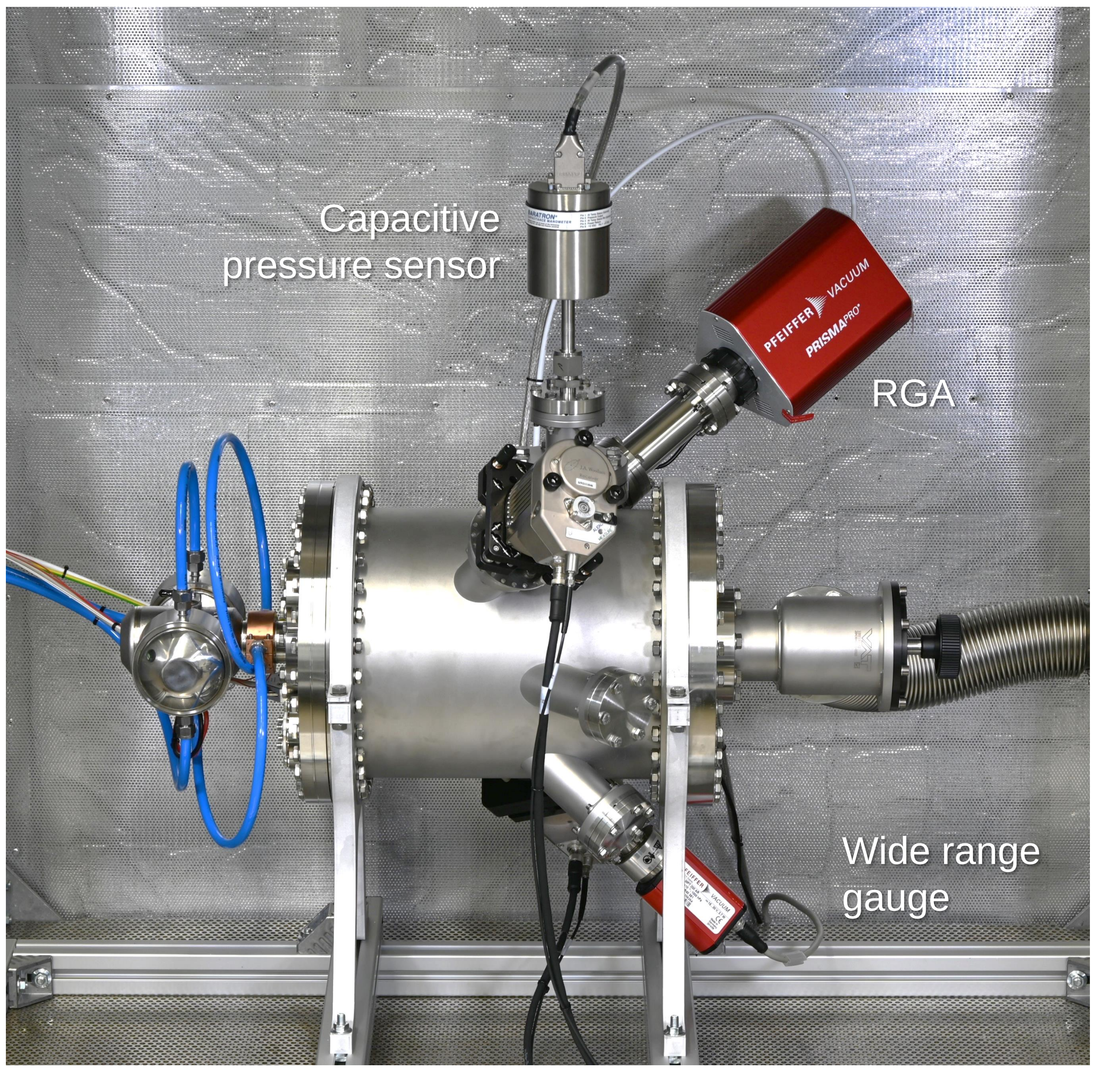
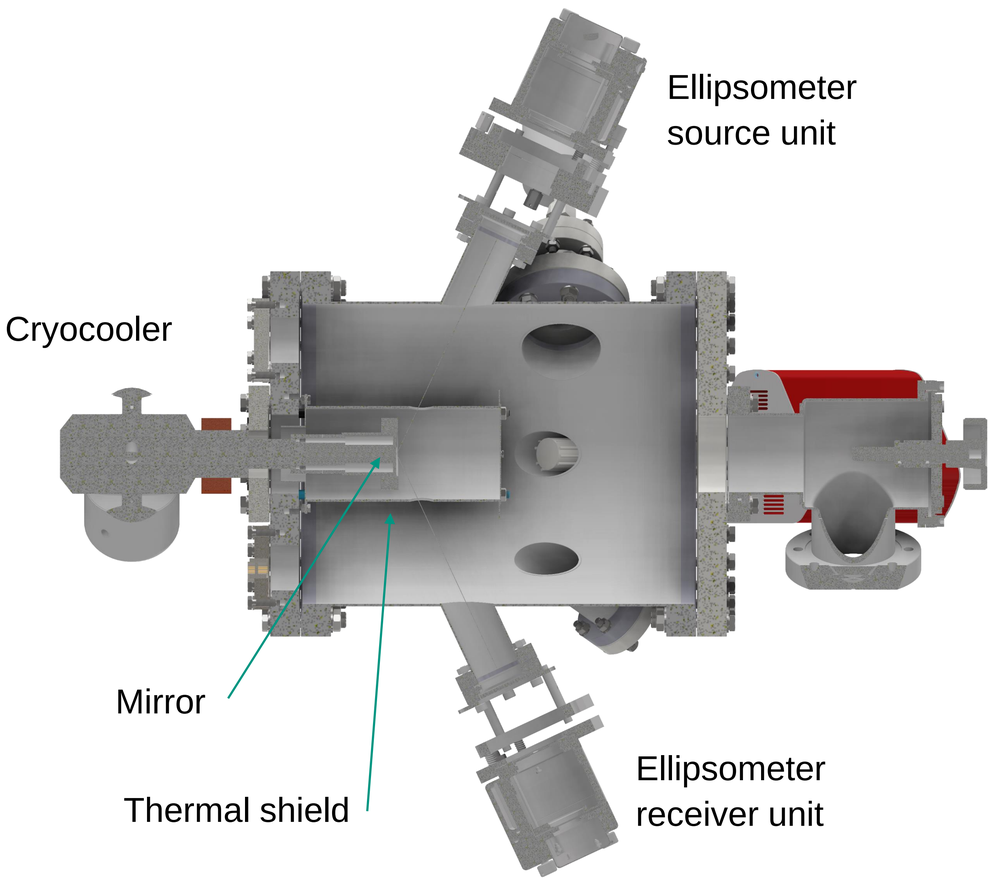
Goal

- **Controlled contamination monitoring** in vacuum on mirror surfaces cooled to cryogenic temperatures in different gas environments like water, CO2, hydrocarbons and other.
- **Develop a versatile test facility for** adsorption / desorption monitoring and in-situ cleaning technologies in vacuum at cryogenic temperatures.
- **Investigate technologies for in-situ monitoring** of adsorption and desorption rates on surfaces:
  - **Spectroscopic ellipsometry for the measurement** of the thickness of the adsorbed layer
  - **Quartz crystal microbalances** are well established for the measurement of mass variations at room temperature and above, but come with challenges at cryogenic temperatures.
  - **Cross-calibration** of both methods
- Investigate technologies for **in-situ cleaning methods** of mirror surfaces at cryogenic temperatures (LF-TM).
  - Electron stimulated desorption (with R. Cimino et al.)
  - UV light
  - Ar plasma



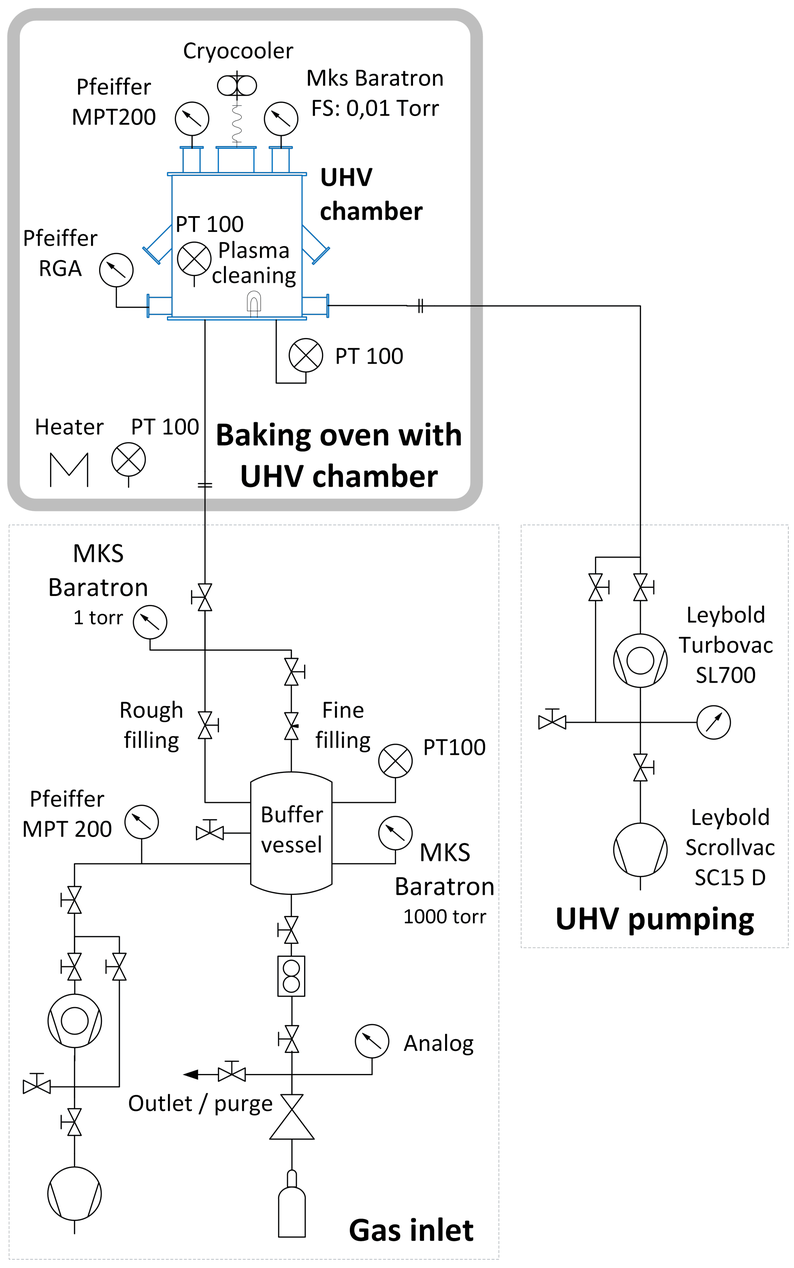
Picture of the experiment



Cross section through the plane of the ellipsometer

Equipment

- **Ellipsometer:** J.A Woollam iSE; 400nm to 1000nm
- **Cryocooler:** Lihan TC4188, water cooled, sterling type, cooling power: 2 W at 40K, 15W at 77K
- **Residual gass analyzer (RGA)**: Pfeiffer Prisma Pro QMG250, measurement range: 1 – 200u
- **Mirror:** Si die from a polished 6” Si wafer
- **Capacitive pressure Sensor**: MKS Baratron, FS = 0,01 Torr
- **Wide range gauge**: Pfeiffer MPT200, measurement range: 5×10^{-9} – 1000 mbar in air, O2, CO, N2



Vacuum and instrumentation scheme