

High Temperature Near-Ambient Pressure X-ray Photoelectron Spectroscopy



The X-ray Photoelectron Spectroscopy device EnviroESCA in the laboratory of Fraunhofer ISE in Freiburg, Germany.

In context of the National Hydrogen and Fuel Cell technology Innovation, Fraunhofer ISE has expanded its R&D infrastructures by operating one of the few facilities worldwide for High Temperature Near-Ambient Pressure X-ray Photoelectron Spectroscopy (HT-NAP-XPS) and thereby sets another milestone for the development of electrolysis and fuel cell systems as well as for hydrogen-based Power to X concepts. The EnviroESCA device opens for partners, e.g. from chemistry and process industries, a broader spectrum of characterization. The system enables the investigation of the chemical status of almost all surfaces under near-ambient pressure conditions.

Potential Applications

Nondestructive in-situ analysis of surface changes due to interaction with gases that influence the composition or oxidation state for various material classes, from

- material science
- microelectronics
- food- and pharmaceutical industry
- archeology and many other research fields

Features of the device

- **X-ray source: AlK_α (1.4 keV)**
- **Spot size: 300 μm Ø**
- **Pressure: 10⁻⁸ mbar up to 25 mbar**
- **Temperature: 5 °C to 1,000 °C**
- **A sample of a size up to 120 mm Ø can be inserted**
- **Samples: crystals, ionic liquids, thin films, plastic materials, inorganic and organic powders, oxides**
- **3 Live-cameras**
- **Gases: N₂, Ar, H₂, O₂ and others (such as CO and CO₂)**
- **Short „loading-to-measurement“ time**
- **Half-automated system: Sample Explorer enables a pre-definition of an unlimited number of measurement positions for up to 9 samples.**