

# 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:  $AlK_{\alpha}$  (1.4 keV)
- Spot size: 300  $\mu\text{m}$   $\varnothing$
- Pressure:  $10^{-8}$  mbar up to 25 mbar
- Temperature: 5  $^{\circ}\text{C}$  to 1,000  $^{\circ}\text{C}$
- A sample of a size up to 120 mm  $\varnothing$  can be inserted
- Samples: crystals, ionic liquids, thin films, plastic materials, inorganic and organic powders, oxides
- 3 Live-cameras
- Gases:  $N_2$ , Ar,  $H_2$ ,  $O_2$  and others (such as CO and  $CO_2$ )
- 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.