# Calipso

**Center for surface analytical services**

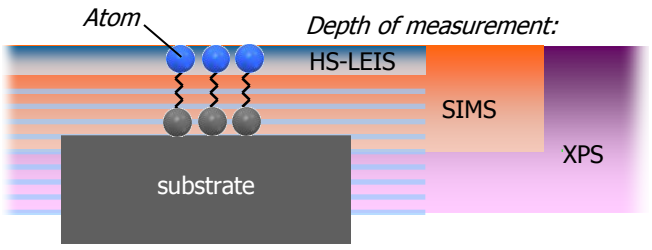
## Expertise center for High Sensitivity Low Energy Ion Scattering (HS-LEIS)

### Activities of Calipso

Calipso provides chemical analysis of the outermost layer of atoms on a material. These measurements are performed with unique HS-LEIS equipment. An understanding of the outermost atomic layer is important since this layer defines the properties of the surface, such as adhesion and wetting properties, and the activity of a catalyst.

A HS-LEIS instrument at Calipso

### HS-LEIS compared to SIMS and XPS:



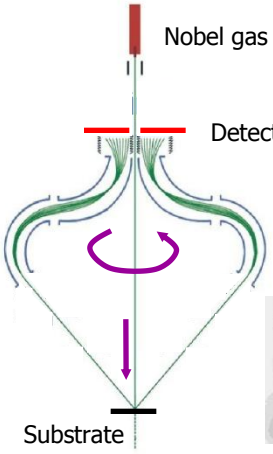

*schematic representation of cross section of surface*

**HS-LEIS** - quantitative 1st atomic layer
- in-depth profile 0-10 nm (shaded area)

**SIMS** - not quantitative (for 1st atomic layer)
- chemical information

**XPS** - information depth of 3 – 10 nm

### Unique HS-LEIS analyzer:




Picture of analyzer

#### Unique features of HS-LEIS:

- Quantitative and highly sensitive measurement of outermost atomic surface layer
- Accurate surface analyses on samples with rough surface
- Analysis on non-conductive materials
- Choice of pretreatment and temperature during analysis

#### Areas of applications:

- Catalysis
- Coatings
- Diffusion Barriers
- Adhesion
- Corrosion
- Biocompatibility

etc.

#### Materials:

- Catalysts
- Metals
- Polymers
- Ceramics
- Biomaterials

etc.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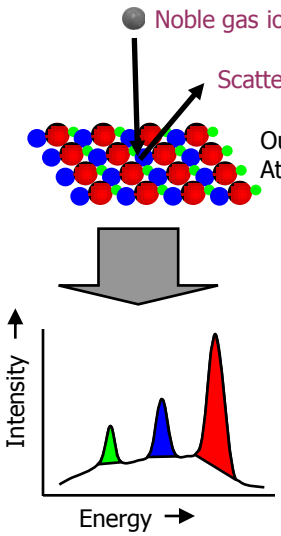
## Types of analyses possible with HS-LEIS

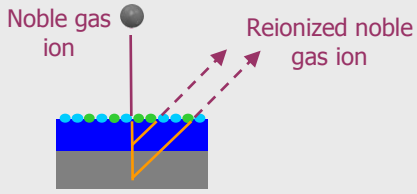
### Measurement of composition



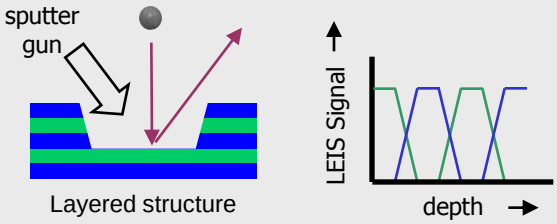

Energy spectrum of the scattered ions

### Measurement of depth profile

**Non-destructive (0-10 nm)**

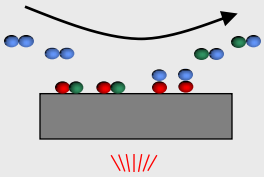



**Destructive (large depths)**



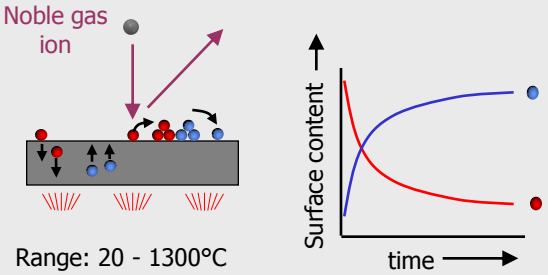

### In-situ treatments

Chemical and/or heat treatment in pre-chamber



Temperature range 20-700°C

Heat treatment in combination with analysis




Range: 20 - 1300°C

### Features of HS-LEIS

| | | |
|---|---|---|
| 1. Monolayer sensitivity | Li – O<br>F – Cl<br>K – U | few % - 1 %<br>1 % - 0.05 %<br>0.05 % - 10 ppm |
| 2. Mass separation | isotopes<br>elements possible | $^{16}O$ / $^{18}O$, $^{63}Cu$ / $^{65}Cu$<br>Al / Si, Ag / Pd |
| 3. Ion dose | < $1.10^{13}$ He ions/cm$^2$ for polymers | |
| 4. Lateral resolution | 0.01 – 0.5 mm | |
| 5. In depth | 0-10 nm | |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