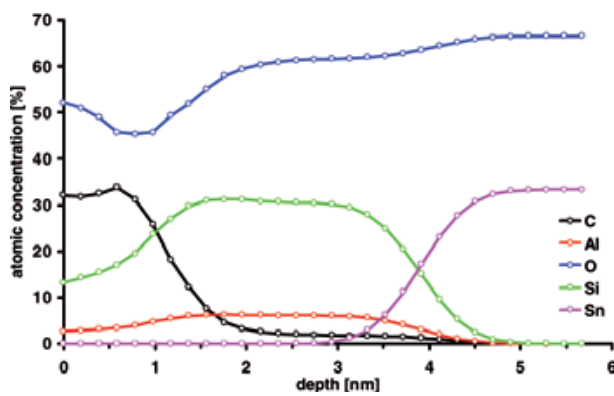
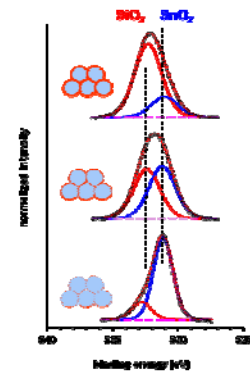


<p>X-Ray Photoelectron Spectroscopy</p> <p>Technology: X-Ray Photoelectron Spectroscopy Surface and Interface Analysis Chemical Characterisation</p> <p>Equipment:</p> <ul style="list-style-type: none"> ▪ K-Alpha XPS Spectrometer ▪ ESCA 5 /Alpha 110 Electron Energy Analyser 	<p>Category: C. Particle Characterisation in and ex-situ</p> <p>Institute: KIT</p> <p>Location: Karlsruhe Institute of Technology Institute for Applied Materials (IAM-WPT) Building 321 Hermann-v.-Helmholtz-Platz 1 D-76344 Eggenstein-Leopoldshafen Germany</p> <p>Contact Details of Technology Expert:</p> <p>Name: Dr. Michael Bruns Phone: +49 721 608-22641 Fax: +49 721 608-92641 E-mail: Michael.Bruns@kit.edu</p>
<p>Short technology description/Overview (<i>approx 300 words</i>):</p> <p>X-ray photoelectron spectroscopy (XPS) is the most widely used surface analysis technique to provide both quantitative atomic concentration and chemical state information of the detected elements. X-ray irradiation of surfaces results in the emission of photoelectrons whose energies are characteristic of the elements. The information depth is approximately 5–7 nm.</p> <p>Angle-resolved XPS offers non-destructive resolution of structures within the XPS sampling depth, e.g. layer ordering, composition and thickness can be determined. Moreover, XPS can be utilized for sputter depth profiling to characterise thin films and multilayer systems by quantifying matrix-level elements as a function of depth.</p>	
<p>Main Features (Equipment Capabilities):</p>	
<p>K-Alpha XPS Spectrometer</p> <ul style="list-style-type: none"> ▪ Mono AlKα X-ray source, spot size 30–400 μm (spatial resolution) ▪ Energy resolution < 0.5 eV FWHM Ag 3d$_{5/2}$ ▪ Ion gun for sputter depth profiling, 200–3000 eV Ar$^+$ ion energy ▪ Charge neutralization system ▪ 50 x 60 mm2 sample stage, sample height max. 15 mm ▪ Tilt stage enabling ARXPS 	<p>ESCA 5 / Alpha 110 Electron Energy Analyser</p> <ul style="list-style-type: none"> ▪ MgKα/AlKα dual anode X-ray source ▪ Energy resolution < 0.85 eV FWHM Ag 3d$_{5/2}$ (MgKα) ▪ Ion gun for sputter depth profiling, 300–3500 eV Ar$^+$ ion energy ▪ Max. sample dimensions 15 x 15 x 2 mm2 ▪ In-situ sample cooling and heating (-190–500 °C) ▪ Fracture stage and T-peeler ▪ Additional Methods: <ul style="list-style-type: none"> - UPS (UV photoelectron spectroscopy) - RGA (residual gas analysis, mass range 1–300 amu)
<p>Limitations / constrains</p> <p>All elements are detectable except for H and He, sample has to be a solid at RT and stable under vacuum conditions, powders are possible.</p> <p>Depending on the chemical composition samples might be sensitive to X-ray radiation</p>	
<p>Typical structures & designs</p>	



Non-destructive ARXPS concentration depth profile of a nanoscale Al-Si-oxide membrane



O 1s XPS spectra of SnO₂ core@SiO₂ shell nanoparticle thin films with different shell thicknesses (core particle size: 5 nm)

Any further information: