

ANALYTICS

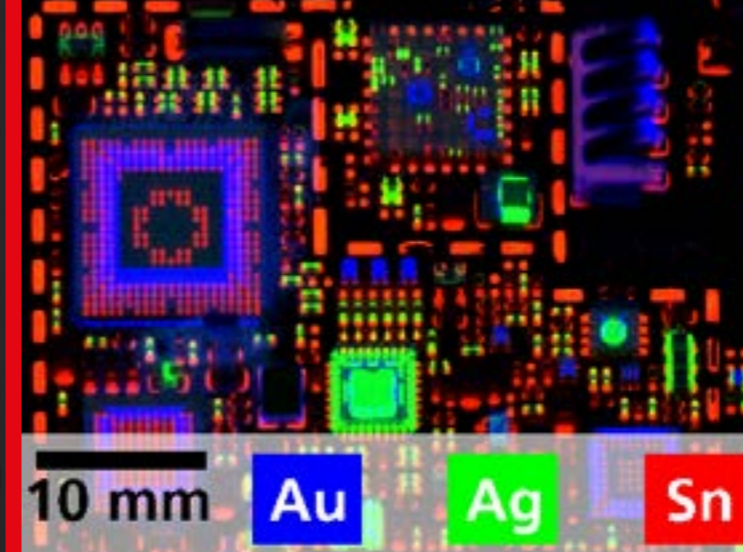
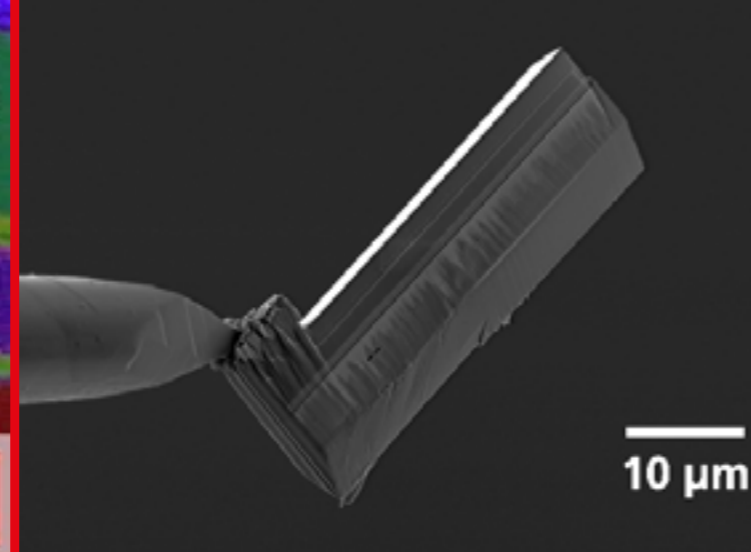
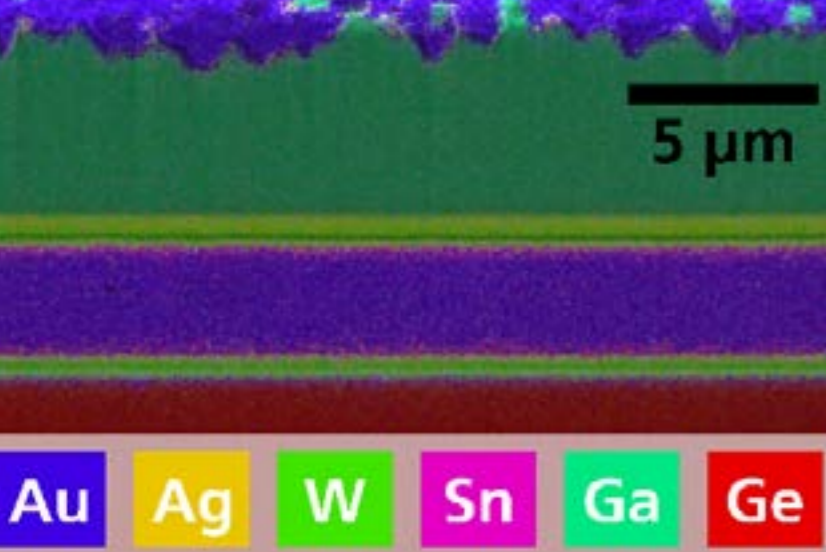
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The Fraunhofer Project Group for Materials Recycling and Resource Strategies IWKS approaches the important economic and social challenges related to resource scarcity and supply chains. To develop innovative solutions for a secure supply of critical resources, the business units and divisions at IWKS work hand in hand with the analytics group to provide its industrial partners with reliable measurements. As part of the Fraunhofer society we offer industry-oriented applied research to link science and economy in order to find the right solution for your problem at hand.

Our department provides its services also to external customers, giving you the opportunity to implement our high-end laboratory equipment to resolve your needs. The core competencies are focused on the analysis of thermal processes, the characterization of magnetic properties, microscopy and micro-analytical methods. Our portfolio of chemically resolved imaging and tomography methods with spatial resolution down to the sub-nm scale and chemical sensitivity on the order of a few ppm covers the full range from tens of centimeters to the order of atomic bond lengths. In addition we offer a broad spectrum of methods for chemical analysis. Several chromatography methods like HPLC, gas chromatography coupled with mass spectrometry, high pressure ion chromatography and a variety of spectroscopic methods allow the investigation of a vast number of possible compositions and mixtures. For applications where high spectral resolution and chemical sensitivity is mandatory, the IWKS analytics division can contribute to your demand with wavelength-dispersive X-ray spectroscopy and state of the art devices for elementary analysis.

Target groups and industry sectors

Powder metallurgy, ceramics and composites
We support and assist in the conceptual design and optimization of sintering and related processes. Sintering can be monitored by in-situ non-contact thermo-optical measurements of the deformation in a high temperature oven with variable atmosphere, including simultaneous measurement of the mass loss and the composition of the gas phases released. Besides precise particle measurements we also offer crystallographic and calorimetric in-situ characterization in the high temperature regime and corrosion studies.

Micro- and nanostructured materials and devices
The specific use and design of nanostructured materials and devices is of utmost importance in modern technological sectors. Yet, only few and highly demanding methods offer the spatial resolution and chemical sensitivity to investigate thin-layer based materials, the distribution of dopants in semiconductor devices, the texture of high performance magnets or in high-tech alloys. At IWKS we characterize your material, determine its composition and morphology and assist in the interpretation of your data.

Organic and inorganic compound materials, luminescent dyes, bio materials and wastewater
In technical applications materials tend to exist in complex mixtures and compositions. Our instruments for element specific imaging allow to investigate all kinds of solid state materials, allowing for example the allocation of secondary resources in microelectronic components on assembled circuit boards or in scoria, down to the analysis of atomic complexation. Compositions of solid, liquid and gaseous compounds are readily obtained by combining chromatographic and spectroscopic approaches, offering sensitivity up to the analysis of trace elements. To improve lighting applications a powerful fluorescence spectrometer is available.

Outline of our Services

- Thermal Analysis**
- Thermo-optical measurements of deformation, under inert gas atmosphere or vacuum, optionally with superimposed load, analysis of the released gas phase and mass loss at temperatures up to 2100 °C
 - Analysis of phase transitions by thermo-gravimetry and differential calorimetry with simultaneous mass spectrometry of the released gas phase, up to 2000 °C
 - High-temperature X-ray diffraction crystallography with reaction cell: inert gas, reactive gas or vacuum, up to 2300 °C
 - Temperature dependent Raman-microscopy up to 300 °C

- Structure Analysis, Microscopy, Micro-Analysis**
- Particle size analysis, dry or in suspension, 30 nm to 10 nm
 - Correlated microscopy with element specific imaging: seamless transition from the centimeter range to sub-nm scales, sensitivity up to the lower ppm range
 - High-resolution light and electron microscopy: light and Raman-microscopy, electron microscopy with x-ray spectroscopy and micro-crystallography, sub-nm scale by 3D-atom probe microscopy
 - Focused ion beam for microscopy sample preparation, 3D-FIB/SEM tomography, preparation of TEM lamellae and atom probe specimen
 - Extensive facilities for sample preparation and secure transport of sensitive samples under vacuum or inert gas

- Material Properties**
- Magnetic properties: temperature dependent magnetization/demagnetization loops up to 2.3 T and 200 °C, Kerr-microscopy for the observation of magnetic domains from 4 K to 600 °C
 - Vibrational magnetometry, magnetic force microscopy, heat capacity and electrical resistance in variable conditions, up to 14 T, 4 K to 700 °C and up to 1.3 GPa
 - Corrosion analysis by highly accelerated stress test (HAST)
 - Rheology, residual water content, density measurement, surface and pore analysis by BET adsorption measurements

- Chromatography and Spectroscopy**
- Gas chromatography coupled with mass spectrometry, high pressure liquid and ion chromatography
 - Time resolved fluorescence spectroscopy with various excitation sources
 - IR, UV-VIS and WDX X-ray fluorescence spectroscopy
 - Inductively coupled plasma optical emission and mass spectrometry, optional laser ablation
 - Elemental analysis by inert gas fusion infrared and thermal conductivity detection: H₂, O₂, N₂, C and S analysis

Interested in a cooperation? We will be glad to advise you and are looking forward to your call or visit at our premises.