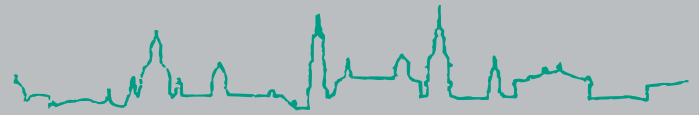




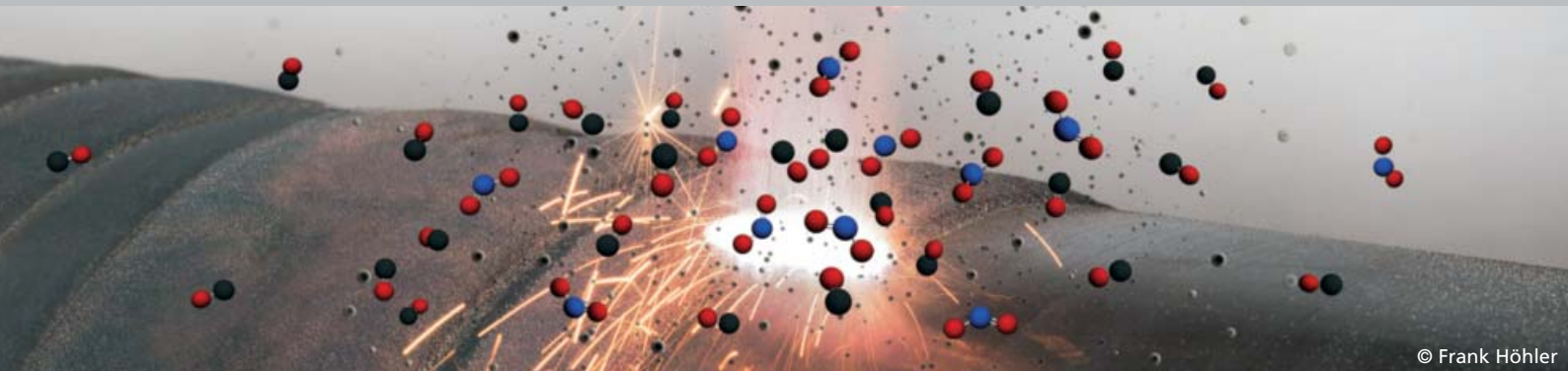
# Fraunhofer

IWS



Dresden

FRAUNHOFER-INSTITUT FÜR WERKSTOFF- UND STRAHLTECHNIK IWS



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## PARTICLE MEASUREMENT AND AIR ANALYTICS

A combination of measurement methods visualises invisible hazards

### Task

Hazardous gases or particles are often being released during industrial processes. These gases can occur during sawing, welding, laser ablation, cutting and during mechanical polishing. The amount of toxic gases or particles may be so small that it cannot be recognised by human visual or olfactory senses. Only in rare cases users are aware of the potential danger.

The Fraunhofer IWS Dresden offers measurement solutions for the objective assessment of atmospheres containing particles. Also chemical substances which do not occur in a particulate form can undergo a qualitative and quantitative analysis. In order to achieve reliable measuring

results the scientists combine various measurement methods from the fields of particle measurement and gas analytics.

### Our offer

- Analysis of exhaust gases
- Examination of atmospheric aerosols
- Assessment of air quality in internal spaces
- Efficiency tests of filters
- Assessment of particle-generating processes
- Studies of combustion processes
- Examination of the workplace safety
- A portfolio of porous filter materials for purging of noxious gases

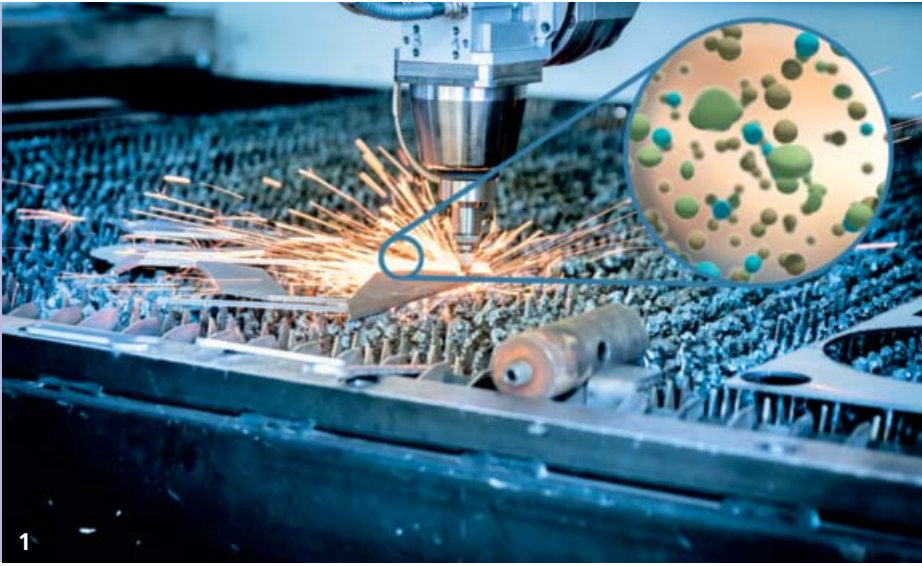
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### Utilization of scientific results

- For the exhaust air:
  - Expertise on a wide range of sub- and micrometer scale particles
  - Basis for the design of exhaust gas filters
  - Estimation of the necessity of a facility for exhaust gas suction and incineration
  - Assessment of processes from the ecologic point of view
- For the ambient air:
  - Avaluation of the air quality at the workplace
  - Measurement of contamination loads in ambient air
  - Consultation services for the design of particle filters

### Portfolio

Various technologies for gas and particle analysis are available. According to the specific customer demands different analysis methods can be combined to achieve tailored measurement setups.

#### Particle measurement systems

- Technologies: scanning mobility particle sizer (SPMS) and aerosol spectrometer
- Particle sizes between 10 nm and 40  $\mu\text{m}$
  - Range of measurement up to  $10^8$  particle/ $\text{cm}^3$
  - High accuracy of the evaluation of measurement results
  - Classification in narrow classes possible
  - Minimal scan duration: 30 s to long-term analysis
  - Flow rate of aerosols: 0,2 to 3 L/min

### Systems for air analytics

Technology: FTIR-spectroscopy

- High measurement accuracy for gases on the parts-per-million scale (ppm)
- Detection of several hazardous gases with only one measurement
- High variability possible by a compact measurement setup
- Short measurement times (< 1 min) for multiple measurements
- Comparison between different gas conditions
- Individual regulation of the gas flow

### Application example

The analysis of the particle sizes and the estimation of the chemical substances in the exhaust gas of a laser machining process are carried out in an exemplary measuring setup. The data can be used for achieving a purposeful and modular filter design. Analogous approaches can be developed for a plurality of processes.

Laser ablation processes:

Sampling of the exhaust gas of a process by a measurement device → Knowledge of the size, amount and characteristics of the particle generated in the process and of the substances in the gas → Evaluation of the hazard potential of the exhaust gas of the process for environment and user → suggestions for removal of the detected components from the exhaust gas

- 1 Particles occurring in a laser process
- 2 Working principle of a SMPS particle size measurement device
- 3 Basic measurement setup of a FTIR process spectrometer

