

1 The ANALIZEmulti measurement system measures the thickness of surface coatings.

2 An ultrashort pulse laser in combination with high-precision distance control allows the thickness to be measured with a precision of less than 5 percent.

## ANALIZEMULTI ANALYZING COATINGS IN THREE DIMENSIONS

The optical surface analysis methods ANALIZEsingle and ANALIZEmulti capture the element composition on the surface of a component within milliseconds per measuring point. The systems are suitable for measuring the composition and thickness of coatings as well as for determining the composition of bulk materials.

### Principle

The underlying technology is Laser-Induced Breakdown Spectroscopy (LIBS), where a short pulse laser ablates a tiny amount – typically just a few  $\mu\text{m}^3$  – from the surface, transforming it into a plasma. This plasma emits with a material-specific light spectrum. The spectral distribution of the light is recorded immediately in real-time. From this data, the element distribution at the measuring point is determined.

ANALIZEmulti uses numerous laser pulses emitted in very quick succession to irradiate the measurement point on the component so that the element distribution is gradually recorded as a function of the depth. This yields a complete analysis of the composition of the coating and workpiece material as well as the coating thickness. ANALIZEmulti measures the thickness of coatings with an accuracy of  $\pm 5$  percent. Layers of 500 nm to 50  $\mu\text{m}$  in thickness can be tested. In particular, it is possible with this method to fully characterize layer sequences of multilayer coatings on a component.

### Areas of application

One application case is the testing of metal layers on metal or plastic components, for example copper coatings for electronic

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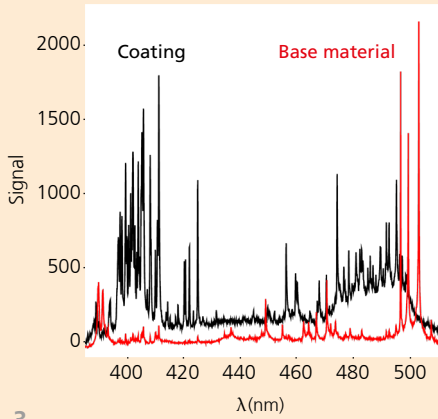
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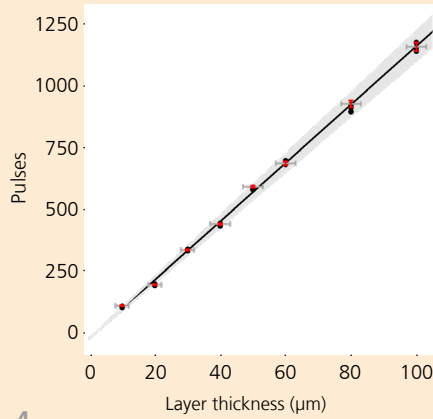
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Plasma spectrum of galvanically deposited nickel on copper



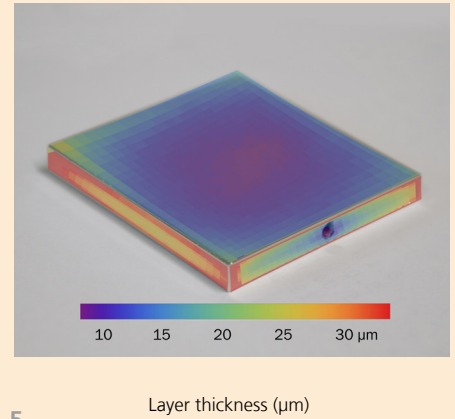
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Linearity of signal and coating weight



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Spatially resolved measurement of coating thickness



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3 Plasma spectrum of nickel plating on copper: Surface spectrum (black), depth spectrum (red) at a depth of 12 μm.

4 ANALIZEmulti counts the laser pulses until the base material appears in the spectrum. A reference sample is used to calibrate the process.

5 Galvanically deposited layers can differ locally due to field inhomogeneities (here: nickel plating on a 50 mm copper sample).

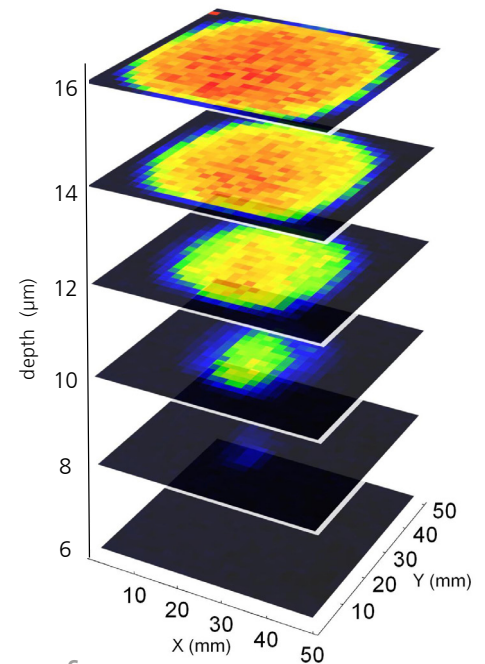
assemblies. In addition, corrosion protection coatings on metals can be analyzed. Numerous other functional layers such as passivations, finishes, or protective coatings can be characterized quickly and reliably in this way.

### Example: Thickness of metallic coatings in power electronics

In the manufacturing of power electronics or semiconductor devices, knowledge of the thickness of metallic coatings is important to enable adaptation of etching or laser machining processes and thus obtain the best processing results. With ANALIZEmulti, it is possible to determine the coating thickness in a few seconds and use it as a control parameter in subsequent processes.

### Lab system

After placing the component to be analyzed in the system, the spectra are taken fully automatically at previously defined positions. The spectra are evaluated directly after they are recorded so that information on the layer thickness or composition of the material is available immediately. In the context of quality control, this enables the testing of components on a sample basis.



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6 Analyzing the sample layer by layer, ANALIZEmulti provides a depth profile of the nickel distribution (same sample as in fig. 5)

#### ANALIZEmulti system specifications

Measurement range, coating thickness	0.5–50 μm
Measurement accuracy, layer thickness 5%	± 5%
Coating materials	Metallic coatings containing silane, phosphate
Measuring time	Typically 1 s per measuring point
Laser spot size	80 μm
Resolution	200 μm
Measurement distance	2–10 cm

All specifications and features are subject to modification without notice.