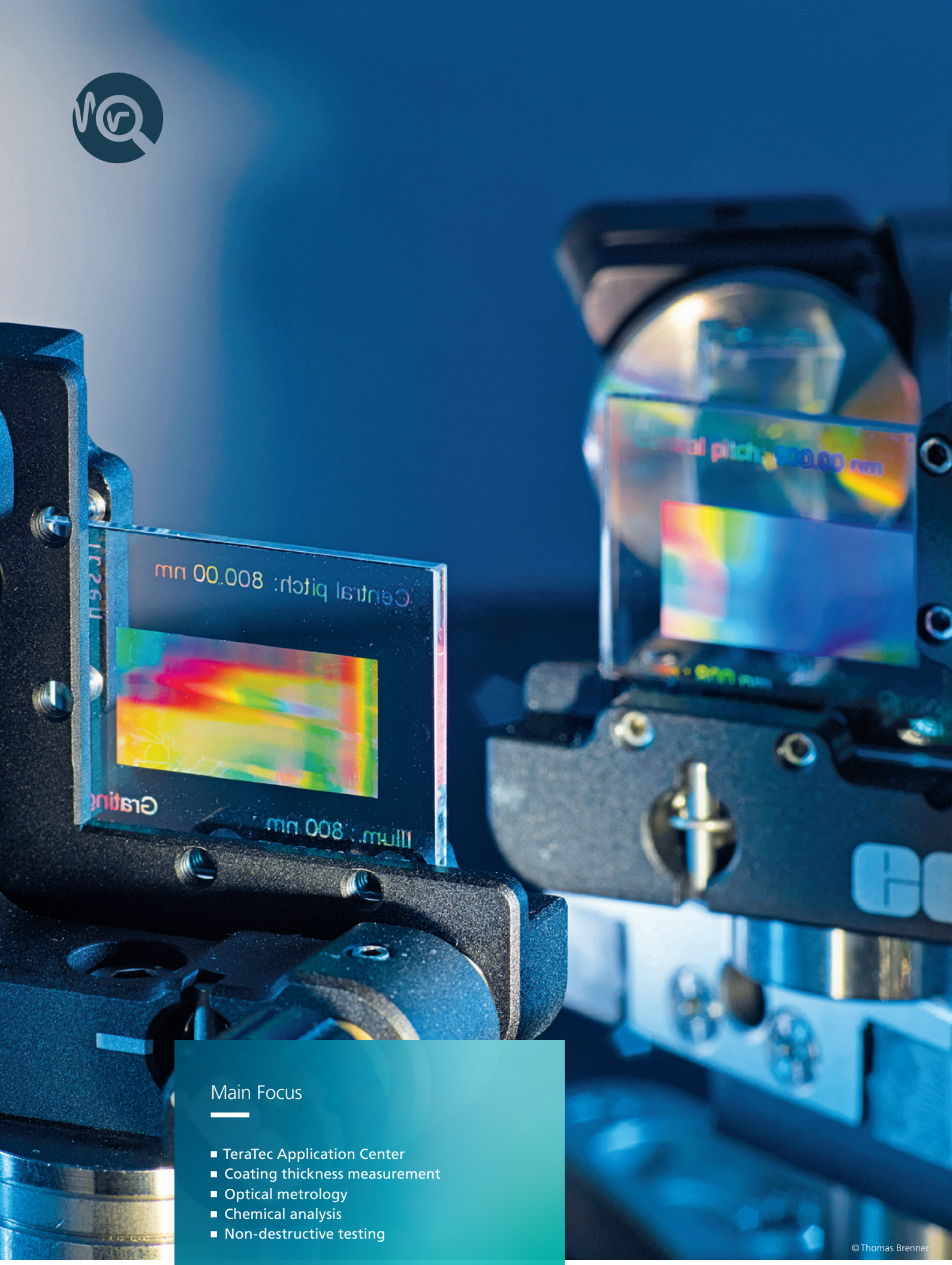

Main Focus

- TeraTec Application Center
- Coating thickness measurement
- Optical metrology
- Chemical analysis
- Non-destructive testing

Material Characterization and Testing

Perspective with millimeter, terahertz and optical waves

Many things remain hidden from the human eye: Most materials are opaque, so we can usually only optically detect the surface of objects. This is not sufficient for checking whether components have been manufactured without defects: Adhesive joints in composite materials, for example rotor blades of wind turbines or also on window panes of vehicles, cannot be inspected in this way.

At the Center for Material Characterization and Testing, we develop non-destructive and non-contact testing methods that are optimized for use in the production line and enable reliable control of the production process. Our terahertz layer thickness gauges measure the thickness and material parameters of each individual layer. Our pipe inspection systems check wall thickness directly at the extruder. Defects in composite materials are detected by our radar-based FMCW inspection system. Bonds can also be inspected in this way. And sometimes we even check the paint layers of famous works of art.

Machine learning helps us recognize subtle material differences so that, for example, wood species can also be reliably distinguished in the chips for particleboard – the mixture is crucial here for the quality and durability of the particleboard.

Our scientists, engineers, and technicians use technologies ranging from optical coherence tomography (OCT) in the visible spectral range to time-domain spectroscopy in the terahertz frequency range and electronic system concepts in the millimeter-wave range for customized solutions. Initial successes in the use of quantum technology enable us to detect material properties in the terahertz frequency range using only visible light. The expertise of our employees includes a detailed understanding of processes. This enables us to transfer results from basic research to application – the latest technological developments can thus be identified and used as solutions for demanding applications.

Department topics in this report:

- Quantum computing: Fraunhofer lead project "QUILT" (Quantum Methods for Advanced Imaging Solutions), p. 19.
- Keeping the Current Flowing: Non-destructive testing of power plant generator rods, p. 54
- From RGB to hyperspectral: Seeing more than the eye can see, p. 72
- TeraSpect for multispectral measurements, p. 73

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