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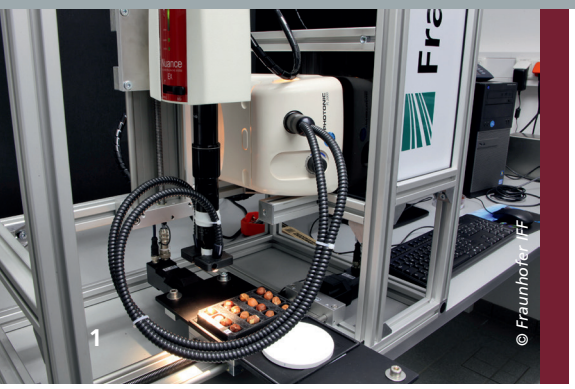

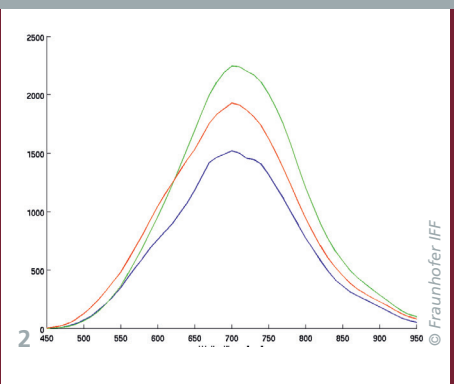

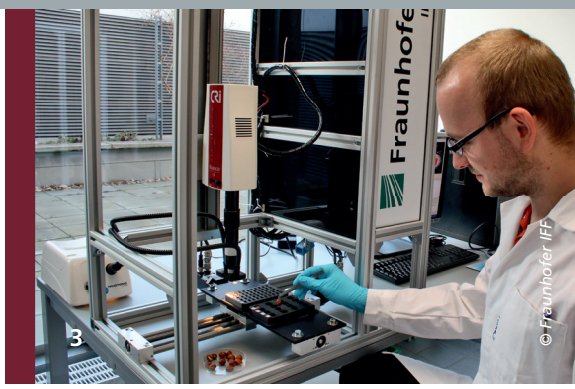

1 *Hyperspectral matrix camera with broad-band illumination and automated sample supply system.*
2 *Recorded spectral distributions.*
3 *Once the automated sample supply system has been filled, the system processes all of the samples autonomously.*

AUTOMATED QUALITY CONTROL USING A HYPER-SPECTRAL MATRIX CAMERA

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Hyperspectral Sensing in Microscopic and Macroscopic Ranges

Detailed and correct determination of the properties of a product to control quality is an integral part of production processes. Quality control stands not only at the end of a process chain but frequently also has to take place in preceding stages of production. This cannot always be done without damaging the product, especially biological (intermediate) products with their inherent natural variability.

The systems developed at the Fraunhofer IFF determine constituents consistently without contact in real time. The hyperspectral imaging used to do this can be embedded in every stage of production to control quality.

Hyperspectral matrix cameras with tunable filters scan microscopic and macroscopic objects at rest. The material composition of the samples can be determined from these very high quality hyperspectral images. The hardware control system is embedded in the complete design so that scanning can be started easily and adjusted to the properties of the object adaptively while scanning.

Analysis Using Artificial Intelligence

The challenge is to interpret the complex, high-dimensional signal patterns generated during hyperspectral imaging. Creating models that use a reference database for quantification and evaluation is time consuming and not very reliable.

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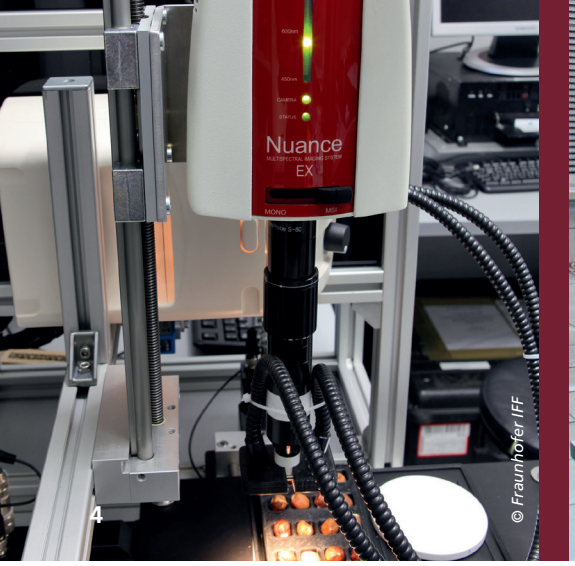

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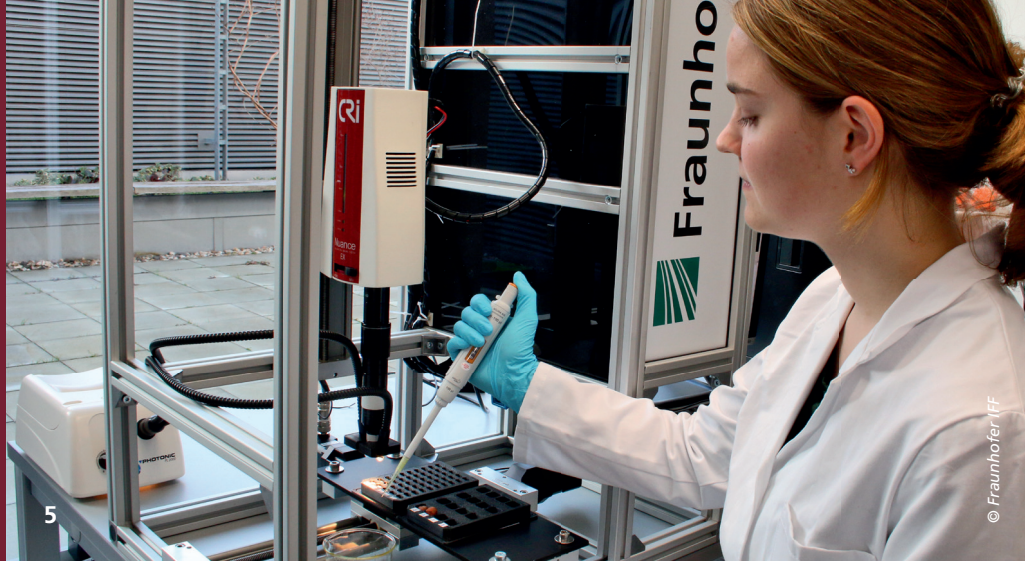

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The Fraunhofer IFF relies on another more efficient approach. We take advantage of the potentials of self-learning systems to model the correlation between spectral signatures and dependent variables, whether this is identity or chemical composition. We implement smart data processing by means of machine learning as a key component. Based on systematically acquired sample data, models are generated, which make it possible to process spectral data in a production process in real time.

This enables us to create solutions customized to your needs in next to no time. In addition, the necessary spectra and potential single wavelengths, which are needed to meet your needs, can be identified. This opens the door for reasonably priced and customized measurement systems that monitor your products.

Applications

- Noninvasive quality assurance of (intermediate) products
- Local automated quality control

Our Services

The Fraunhofer IFF is your partner for the development and implementation of quality control systems customized to your needs. A development undertaken with us may entail the following stages:

Step 1: Systematic Data Aquisition
In the first step, we systematically collect hyperspectral image data of your samples at your facilities or in our spectral laboratory. If necessary, supporting dependent variables can be acquired by a contracted food chemistry laboratory. The collection of data covers your specific needs.

Step 2: Measurement Model Development
Taking the collected data as its starting point, a measurement model is created, which models the non-trivial correlation between spectral image data and dependent variables, e.g. the material identity or chemical properties. A range of methods of machine learning is resorted to and the best model is selected and adapted to your needs.

Step 3: Model Validation
We validate the measurement model's performance extensively, thus enabling us to provide information on the expected measuring accuracies, processing times, and necessary spectra. This validation is the basis for the subsequent development of the system.

Step 4: System Development and Integration
Based on the findings from the model's validation, we create a quality control system customized for you, which is based on spectral data and optimized data analysis. This system can be integrated in your existing quality assurance systems and procedures.

Your Value Added

Automated: No manual procedures are required to perform analysis during production.

Online: Data is evaluated in the production cycle and can be used to immediately label or grade items or to intervene in the production process.

Integrated: The system uses compact and robust sensors, which can be integrated in the production process. Results of data analysis can be integrated in existing data acquisition and control systems.

Noninvasive: This method of measurement does not damage your product.

Optimized: You receive a control system with hardware and software customized to your needs.

4 *The system scans every sample sequentially at different wavelengths.*
5 *The system can be used to automate a wide variety of measurement tasks.*