Anton Paar

Clear Spectra, Faster Decisions:
How BÜFA Uses Raman to Understand Reactive Resin Systems

Cora 5001

→ Filling a barrel with red BÜFA®-gelcoat at the end of the production line.

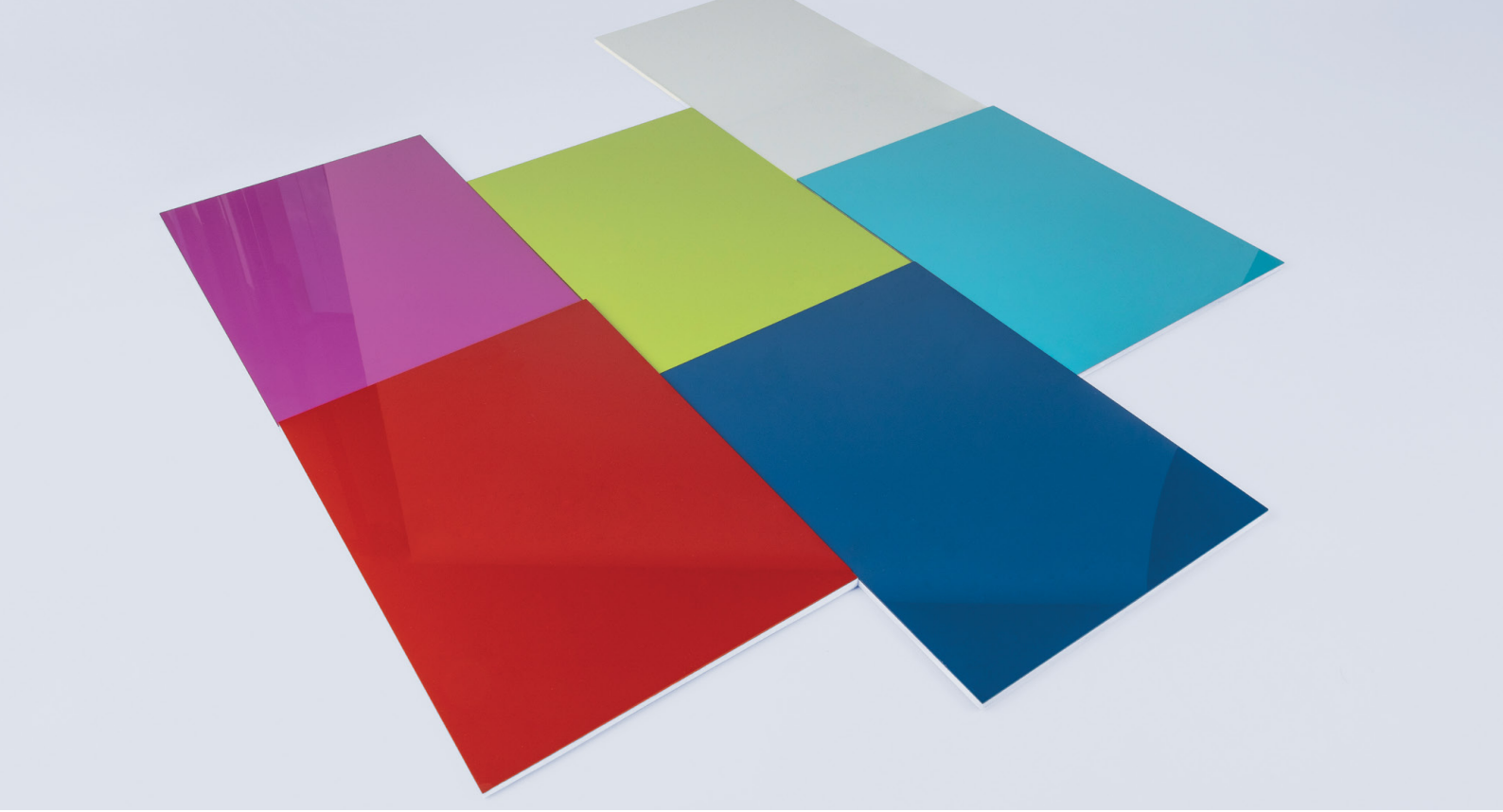
When your business is built on delivering consistent, high-performance resin systems, the details matter. At BÜFA, that means understanding not only what goes into a formulation, but also what happens during reaction and curing.

Matthias Rastede, M.Sc., is a senior scientist and project manager at BÜFA, an independent, medium-sized chemical company founded in Oldenburg in 1883. Today, BÜFA operates internationally across chemicals, cleaning, and composites, with a focus on innovative, environmentally conscious products used in markets such as rail, wind energy, construction, and more. Within the group, BÜFA Composite Systems is Europe's leading manufacturer of polyester resin specialties, supplying complete solutions and application know-how across the composites industry.

The challenge: Proving what's happening in reactive systems
In BÜFA's lab environment, one recurring question was difficult to answer with confidence: What is the chemical structure after curing, and how complete is the conversion?

"One of our key challenges was finding a method that would allow us to reliably assess the chemical structure and the degree of conversion in our reactive resin systems," Matthias explains. "With DSC, for example, we couldn't always determine with certainty whether a homogeneous polymer network had formed through copolymerization or whether certain reaction partners hadn't participated in the crosslinking reaction as expected."

BÜFA's team measures polyester resin systems, solvent mixtures, and raw materials. Beyond that, their analytical work spans rheological testing of mostly thixotropic resin systems, investigation of reaction and curing properties



→ Coloring options for BÜFA® conductive tooling gelcoats.

(including DSC and temperature profiles), color adjustments to customer requirements, aging behavior (hydrolysis and weathering resistance), and purity determination of simple substance mixtures.

Across all these tasks, Matthias summarizes the key requirement simply: “For us, the clarity and reliability of the measurement results are crucial.”

Raman: A clearer fingerprint for decision-making
BÜFA’s search started with the literature and then expanded online, focusing first on IR for tracking functional group changes.

Several instrument vendors were contacted specifically regarding FTIR solutions that could help analyze the molecular interactions in their resin systems.

During these discussions, Anton Paar proposed expanding the evaluation to include Raman spectroscopy in addition to FTIR. This suggestion opened the possibility of comparing both techniques using BÜFA’s own samples.

A hands-on instrument demonstration became the turning point. Samples were measured using both an FTIR and a Raman spectrometer, and the difference was immediate.

“It became evident that the Raman spectrum appeared significantly more structured in the wavenumber range relevant to us and displayed fewer bands that could lead to misinterpretation,” Matthias says. “The signals we were looking for were clearly and unambiguously identifiable.”

That clarity wasn’t the only deciding factor. BÜFA evaluated multiple well-known suppliers, but responsiveness and application guidance carried the most weight.

“The speed and quality of responses to our inquiries were decisive criteria,” Matthias notes. “Price naturally also played a role, but not the most important one.”

“What really stands out to me is the simplicity of both sample preparation and measurement.”

Matthias Rastede, M.Sc.,
Senior Scientist, BÜFA

→ Osmosis test for topcoat systems that are in constant contact with water (boat building, pool construction, etc.) to assess hydrolysis resistance and surface changes.

The solution: Cora 5001 Raman spectrometer in routine use
Following the comparative measurements, BÜFA decided to implement Raman spectroscopy with Cora 5001. The results obtained during the application tests demonstrated that Raman provided the most informative spectral data for analyzing the bonding behavior within their formulations. Because BÜFA was already familiar with Anton Paar through other laboratory instruments, the collaboration continued smoothly from evaluation to implementation.

“Technical support and the guidance provided in addressing our problem were ultimately the decisive influence,” Matthias says. “The consultation from Anton Paar convinced me that our problem could be solved with the requested methods. Additionally, it was carefully assessed whether Raman spectroscopy might be more helpful for us than the IR spectrometer.”

Once BÜFA implemented Cora 5001, the instrument quickly moved from evaluation to daily work.

“What really stands out to me is the simplicity of both sample preparation and measurement,” Matthias says.

Within weeks, the team started translating spectra into actionable development insights.

“After just a few weeks of using the Cora 5001, we were already gaining valuable insights into our chemistry,” Matthias explains, “and I’m confident that the Raman spectrometer will play a decisive role in identifying optimal reaction conditions.”

Practical impact: From development to troubleshooting
Today, BÜFA uses Cora 5001 several times a week – primarily in product development and increasingly across adjacent workflows – to support tasks such as:

- Understanding bonding states in reactive systems to connect formulation changes with chemical structure
- Comparing curing conditions to identify optimal parameters more confidently
- Investigating quality concerns in production samples, such as verifying solvent mixture composition or checking for potential foreign substances

"For our work, the speed and reproducibility of the measurements are particularly valuable," Matthias says.

And when time is critical, the workflow matters as much as the data: "Above all, the straightforward sample preparation and measurement process are extremely helpful."

"The friendly and helpful technical support, which we have valued for many years, convinced us."

Matthias Rastede, M.Sc.,
Senior Scientist, BÜFA

Collaboration and what comes next
BÜFA describes the purchasing process as smooth and highly practical, supported by an instrument demonstration and responsive technical exchange.

"From the beginning, we received solid advice regarding our problem," Matthias says. "Communication and information exchange during the purchasing process helped to eliminate potential obstacles, allowing us to purchase the instrument before the end of the fiscal year, which supported our budget planning."

With routine use established, BÜFA is now expanding Raman beyond development. The Product Quality department has already run initial test series in response to process irregularities, such as identifying incorrect dosages. Longer term, BÜFA intends to introduce Raman spectroscopy into quality control, incoming goods inspection (raw material verification), and purity determination – once methods are developed and validated to internal quality standards.

"It is already a daily component of development work," Matthias says, "and will in the future also be used for quality control and incoming goods inspection."

Asked for a single-sentence reason behind the decision, Matthias keeps it direct: "The friendly and helpful technical support, which we have valued for many years, convinced us."

Find out more

Instrument: Cora 5001 Benchtop Raman spectrometer

Model: 785 nm with sample compartment

Characteristics analyzed: Changes in functional groups

Samples: Unsaturated polyester resins