

NIR POLARIMETRY IN SUGAR ANALYSIS

Analysis of dark samples with chemical-free filtration

Challenge, Applications & Method

CHALLENGE

- Hazardous chemicals in traditional sample clarification
- Time-consuming sample preparation
- Difficulty analyzing dark or turbid samples
- Increasing demand for sustainable and automated workflows

APPLICATIONS

- Determination of sucrose content and purity in beet and cane sugar
- Quality control in sugar production and refining
- Monitoring of process streams (raw juice, molasses, syrups)
- Integration into automated laboratory and factory workflows

METHOD

- Chemical-free sample preparation using pressure filtration
- Measurement of optical rotation at NIR wavelength (882 nm)
- Combination of spectroscopy and polarimetry principles
- Automated and high-throughput analysis

Sample Preparation as a Key Challenge

Sample preparation is a critical step in sugar analysis and often represents the main bottleneck in laboratory workflows. Conventional filtration methods, especially those combined with chemical clarification, are time-consuming, labor-intensive, and environmentally critical. They require multiple manual steps, are prone to inconsistencies, and limit sample throughput.

Advantages of Automated Filtration

Automated filtration systems such as pressurized filtration provide a reliable and efficient alternative. They enable fast, reproducible sample preparation without the use of hazardous chemicals and significantly reduce operator dependency. By removing turbidity while preserving the original sample composition, automated filtration ensures consistent conditions for subsequent analysis and allows high-throughput operation in modern laboratories.

NIR Polarimetry at 882 nm

Building on this optimized sample preparation, near-infrared (NIR) polarimetry offers a powerful method for sucrose analysis.

By measuring optical rotation at a wavelength of approximately 882 nm, the technique enables accurate determination of sucrose content and purity even in dark or highly colored samples. Unlike conventional visible-light polarimetry at 589 nm, NIR polarimetry allows direct measurement without chemical clarification, simplifying workflows and improving laboratory safety.

The method combines the specificity of optical rotation with the robustness of spectroscopic techniques, enabling fast and reliable results across different sugar process streams. It supports continuous monitoring of sucrose content and purity, contributing to improved process control and production efficiency.

Integrated and Automated Workflow

In modern systems, automated filtration, polarimetric measurement, and data evaluation are fully integrated. The measured polarization values are directly used to determine sucrose content and purity, often in combination with refractometric data. This seamless workflow enables high reproducibility, minimal operator intervention, and efficient, fully automated sugar analysis.

Solution From SCHMIDT + HAENSCH

Using the SCHMIDT + HAENSCH AutoFilt Z in combination with the Purity Analyzer, a combination of a polarimeter (Polartronic V or Saccharomat V) and refractometer (e.g. ATR P) provides a robust method for determining sucrose content and purity in sugar production. Integrated into the laboratory workflow, AutoFilt Z ensures fast and reproducible sample preparation without the need for hazardous clarification chemicals, while the Purity Analyzer combines polarimetric and refractometric measurements in a single system. By measuring optical rotation at near-infrared wavelengths, even dark or highly colored samples can be analyzed directly, eliminating time-consuming preparation steps. The result is an efficient workflow with precise purity determination, optimized resource usage, and minimal operator intervention.



Purity Analyzer
Sugar analysis laboratory

AutoFilt Z
Automatic Filtration

Product type	Product	ID-N°
Laborautomation	AutoFilt Z	10800
Polarimeter + Refractometer	Purity Analyzer: Polartronic V + ATR P	14693
Polarimeter + Refractometer	Purity Analyzer: Saccharomat V + ATR P	14696
Accessories	Tubing Set	16093
Accessories	Polarimeter tube with funnel and riser; 200 mL	09213

ADVANTAGES

- Chemical-free analysis – eliminates hazardous clarification agents
- Fast and efficient – significantly reduces analysis time
- Non-destructive method – preserves sample integrity
- Suitable for dark samples – no clarification required
- High accuracy and reproducibility
- Reduced environmental impact and operational costs
- Automation-ready – ideal for high-throughput laboratories

TYPICAL INDUSTRIES

- Sugar production (beet and cane)
- Sugar refineries