

**Report from**

BlueSens gas sensor GmbH
Snirgelskamp 25
45699 Herten, Germany

Data with friendly permission of:

Clariant Produkte (Deutschland)
GmbH
Sammelweisstraße 1
82152 Planegg, Germany

Continuous, modern gas analysis from BlueSens: The BlueVary as an alternative to mass spectrometry

BlueSens is known for modern, high-quality gas analysis for the bioprocess technology sector and the BlueVary offers an attractive alternative to conventional instruments with its replaceable gas measurement cartridges that do not require maintenance.

The compact BlueVary instruments can be hung directly in the exhaust gas stream of the fermenter without much effort, thus sitting behind the sterile barrier and accessible at any time for easy calibration prior to measurement. The output values are already pressure and moisture compensated.

Questioning: Can a modern gas analyzer be used for quick insights without the expense of mass spectrometry?

What was done?

For a comparative test, the BlueVary (BlueSens, Germany) was compared with a mass spectrometer (MS) on a fermentation with a filamentous fungus in a 10 L scale. Reliable gas analysis in the process exhaust air is of great importance in this context in order to identify and track different events and the resulting effects on the metabolic rate of the organism. The results shown below were prepared and provided by Clariant Produkte (Deutschland) GmbH.

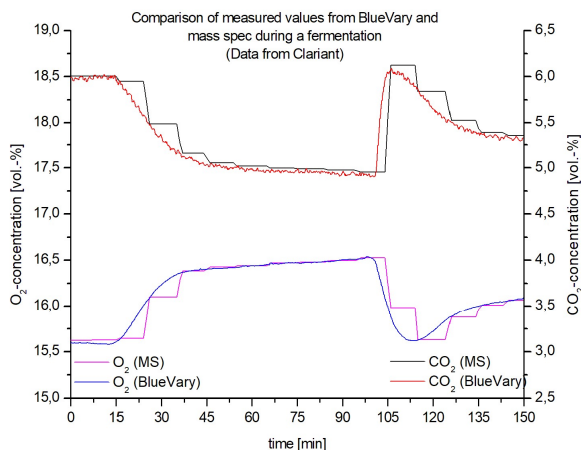
The mass spectrometer (MS) was multiplexed (30-fold). Measured values were thus output every 10 minutes. With the BlueVary, measured values could be updated in BlueVIS every 10 seconds. The mass spectrometer used is a "magnetic sector" mass spectrometer. Ions are quantified based on different masses in the detector.

The slots of the BlueVary centrum panel were equipped with a CO₂ measuring cartridge (0-10 vol.%) based on IR measuring technology and an O₂ measuring cartridge (0-25 vol.%). Humidity and pressure fluctuations were

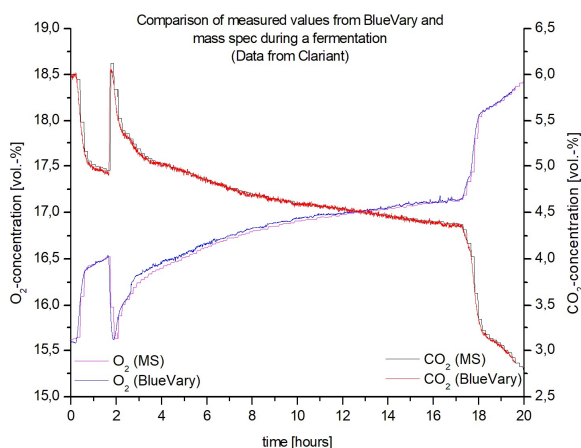
measured via the pressure/humidity cartridge in the third slot and automatically compensated.

In order to compare the reaction times or the generated measured values of both devices with each other, a nutrient solution was added after 2 hours, which is converted by the organism in the further course.

Results: The courses of the CO₂ and O₂ concentrations, shown in the two figures, show almost parallel courses of the BlueVary values with the MS values.



The reaction of the cultures to the event after 2h running time are clearly visible in both gas profiles.



Due to the continuous measurement and the resulting higher data density, the BlueVary shows the events even earlier in some cases, since the reaction of the

organism to the addition of the nutrient solution can be detected immediately (2h) and also the time at which the substrate is completely consumed after 18h can be detected more quickly.

Conclusion: The BlueVary delivers clean, reliable measurement results and is ideally suited as an alternative to the mass spectrometer, not least because of the significantly lower acquisition costs. The compact gas analyzer measures continuously and provides the user with complete data in high density. Events and reactions of the culture are visible at an early stage(s). To cover other measuring ranges, only the gas measuring cartridges in the BlueVary have to be exchanged and inserted. Thus, several measuring tasks can be solved with one instrument. BlueVary can be operated without special training and calibrated by the user himself in a simple procedure. The principle of exchangeable cartridges also offers the advantage that BlueVary does not require annual factory calibration.