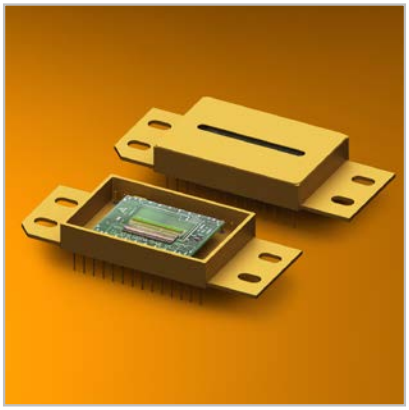
Good Wine – Not Just a Matter of Taste

IR technology can be used to find out valuable information about a wine



In a product with a thousand-year-old tradition, it is not surprising that wine production depends very heavily on the experience and gut feeling of the winemaker. It is only recently that science has found its way into this field. Meanwhile, almost all biochemical processes have been identified that are used to make wine from the juice of grapes. Because vinification is a complex process, the quality of wine depends on many different factors. IR measurement methods are, therefore, very useful to vintners during production.

The Grapes Make the Wine

During vintage, it is crucial that the harvested grapes be processed as quickly as possible. In a mill they are mashed together with the seeds and skin. In the production of white wine, this mash then stands for one to six hours before being processed into must. During this time, the first substances already take shape that then later affect the quality and taste of the wine.

Analyzing Mash with the Help of Spectroscopy

For a long time, spectroscopic measurements in the mid-infrared range have provided press operators with a comprehensive analysis of the mash and its contents. This provides the press operator with the ability to not only identify undesired microorganisms but to draw conclusions about the properties of the most.

Analyzing Grapes with the Help of NIR Spectroscopy

Scientists at the State Educational and Research Institute for Viticulture and Pomology in Weinsberg have developed a method in which the quality of individual grapes can be tested before mashing.

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To date, the grapes provided have always undergone visual quality control and been sorted accordingly; however, even experienced professionals can make mistakes because many microorganisms that settle on the fruits in the vineyard are not visible to the human eye. Although the presence of yeasts can be quite desirable, some can lead to early fermentation, which can complicate vinification.

With the help of near-infrared spectroscopy – a new method in this field – important contents are measured while the grapes are filled into the mill. Based on the concentration of glucose, fructose, tartaric acid, and malic acid, the degree of maturity can be determined, for example. Acetic acid, gluconic acid, glycerin, and the ergosterol produced by mold show, however, that the degradation process has already started. Based on this data, the cellar master can adjust the further vinification process to suit the quality of the grapes.

A Long Fermentation Process Will Eventually Produce Wine

After mashing, white wine is pressed: the pomace (i.e., the solid components such as the skin and the seeds) is separated from the liquid must, which then ferments and ultimately turns to wine.

This is the crucial difference between the production of white wine and red wine: Because the red color and many of the flavors come from the skins and seeds, the mash is fermented in red wine. It is not placed in the winepress until after fermentation is complete.

To achieve an optimal ethanol yield and prevent impurities, as little air as possible should enter the container during fermentation. At the same time, however, the carbon dioxide produced must escape; otherwise, the fermentation container would burst. This is achieved with special fermentation vats. Nevertheless, winemakers prefer to keep an eye on the development of the wine in this critical phase of vinification. IR technology helps in this respect.

FTIR Spectroscopy during Fermentation

Classic FTIR spectroscopy is ideally suited for this purpose. In devices such as the OenoFoss by Foss, a single drop of must or wine is sufficient to analyze up to seven different parameters. This allows the winemaker, for example, to determine within a matter of minutes how far advanced the fermentation process is. The measurement results allow him the ability to draw conclusions about the finished wine and perhaps change something. These devices make it possible to make very precise measurements.

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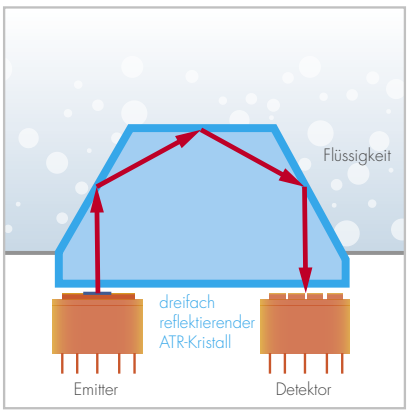
In-Situ Measurement



Another method originates from the U.S. manufacturer VitalSensors. They work according to the principle of the attenuated total reflection (ATR) of MIR beams at the interface between crystal and liquid. The measurement system with a triple reflecting ATR crystal is applied directly to the fermentation tank or the pipes (see figure). These in-situ measurements have the advantage that they do not allow air to come into contact with the fermenting must, and the cellar master can still obtain all of the important information on the temperature and concentration of the four important contents at any time. It is does not matter whether the tanks contain a clear (white wine) or opaque (red wine) liquid.

This helps to convert the grapes into the best possible wine using infrared technology.

If It Bubbles

Sparkling and semi-sparkling wines can be produced using different methods. The best-known method is the "champagne method," in which the finished wine is fermented one more time in the bottle by adding yeast and sugar. It is crucial in the end product that the carbon dioxide produce negative pressure. This leads to the refreshing tingling sensation that champagne and prosecco drinkers love. At a positive pressure of 3 bars at room temperature, the wine is referred to as sparkling; at a positive pressure of 1 to 2.5 bars, the wine is referred to as semi-sparkling.

How do you tell how much carbon dioxide is in a closed bottle? IR technology can also be used here. An Austrian manufacturer has developed a device that measures the CO_2 concentration without having to open the seal. A laser beam is guided through the upper part of the bottle and analyzed using a detector. The best part is that the bottle can still be used after that.

This measurement method not only works in champagne and Cava but in comparably "primitive" drinks such as cola or other soft drinks.

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