

Enzyme Detection in Flour

PROZESS
TECHNOLOGIE



APPLICATION NOTES

Detector: Reveal LIF process analyzer
(Light-induced Florescence
250–850 nm)



HIGHLIGHTS

- Selectable LED excitation sources
- Millisecond measurement times
- Internal referencing, wavelength and linearity validation for stable, continuous operation
- WiFi, Ethernet, OPC, ModBus, Ethernet/IP communications standard
- Hazardous area enclosure options
- Various sampling options



Summary

The measurement of key enzymes in flour permits manufacturers to ensure that these catalysts are present in concentrations necessary for chemical reactions that occur during the baking process. These enzymes are involved in diverse applications throughout the manufacturing process including extending shelf life, improving dough handling, keeping the bread fresher tasting, and giving manufacturers greater control over aspects of their products such as color, flavor, or crumb texture. Enzymes also can replace chemical additives. Thus, enzymes play a paramount role in helping manufacturers craft a more unique product, diversify their product line, and decrease experimental costs.

Enzyme Detection

Several excitation wavelengths were evaluated to identify those that provided detailed spectral information about the concentration of the enzymes in the flour. *Figures 1-3* illustrate the fluorescence profiles generated using (a) 280 nm, (b) 315 nm, and (c) 370 nm excitation wavelengths. These were identified as the three wavelengths that provided the most useful spectral information.

The enzymes were measured in a wheat flour preparation and were accurately detected with the Prozess LIF analyzer with a standard error of 0.2% (*Figure 4*).

Reveal

The Prozes Technologie Reveal LIF instrument provides millisecond measurements, a variety of sample interfaces, and rugged system designs for the manufacturing environment, such as solarisation-resistant fiber-optic bundles, enabling users to acquire data in real-time, and make modifications during their process to ensure proper quality control and efficiency.

The Reveal contains integrated light sources and dispersive spectrometers utilizing linear diode array detectors, with no moving parts for high throughput and maximum stability. The Reveal contains automated internal hardware for lamp referencing and for wavelength and photometric linearity validation, all of which can be performed at user-defined intervals. Standard communications in the system include WiFi, Ethernet, OPC, ModBus and Ethernet/IP for upstream and downstream interface with distributed control systems, computers, or tablets. Sampling options range from flow cells with selectable path lengths, to measuring heads that mate to sight glasses in vessels, to fiber probes for contact or non-contact measurement in various insertion points.

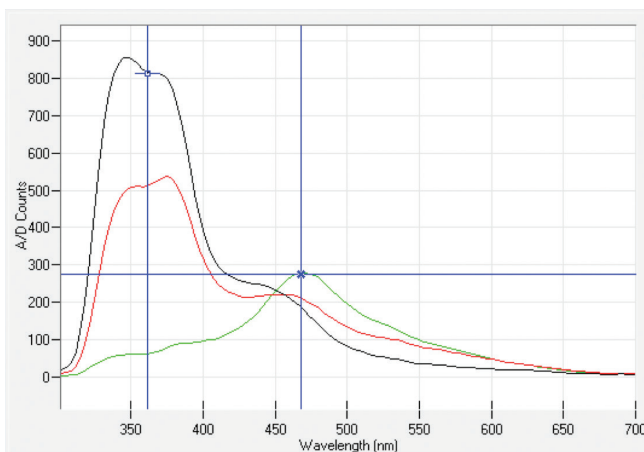


Figure 1: Fluorescence spectra from 280 nm excitation show distinct features for Pure Enzyme #1 but significant overlap between flour and an amyloglucosidase preparation (black: wheat flour, red: amyloglucosidase preparation, green: Pure Enzyme #1)

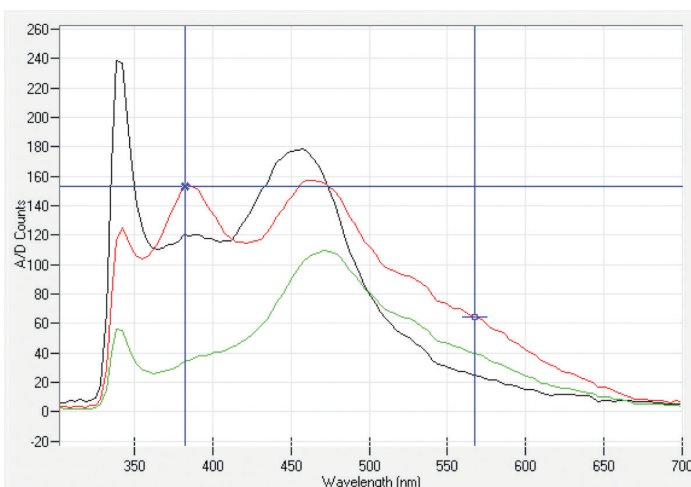


Figure 2: Fluorescence spectra from 315 nm excitation show distinct features for an amyloglucosidase preparation (black: wheat flour, red: amyloglucosidase preparation, green: Pure Enzyme #1)

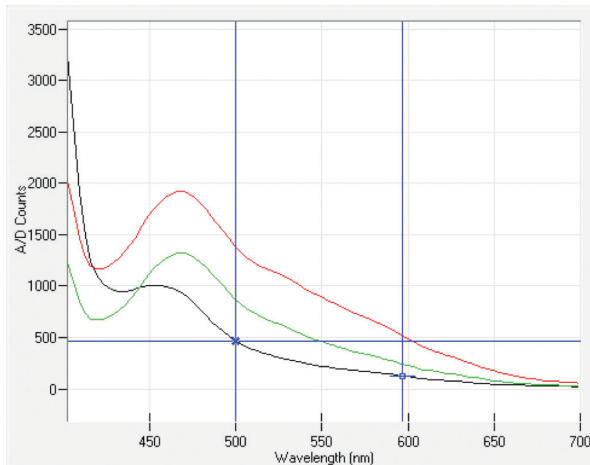


Figure 3: Fluorescence spectra from 370 nm excitation show distinct features for an amyloglucosidase preparation (black: wheat flour, red: amyloglucosidase preparation, green: Pure Enzyme #1)

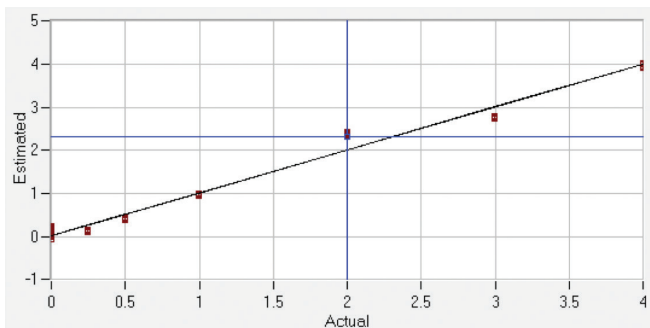


Figure 4: Representative partial least squares regression from 370 nm excitation showing strong correlation for an enzyme mix.

PROCESS MEASUREMENT made simple

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