

Simple, Instant Determination of Fish and Seafood Freshness

Key Benefits

Instant analysis of all volatile freshness markers

Minimal sample preparation

Simple operation

Easily configured for multiple products

Industry-proven robust technology



SIFT-MS provides instant, direct analysis of volatile freshness markers emitted from fish and seafood, ensuring that products are fresh.

Consumer acceptance and food safety are key concerns for wholesalers and retailers of fresh fish and seafood products. Although consumers provide the ultimate feedback on quality, suitable instrument-based methods can provide rapid analysis, objectivity, and low costs per sample, which are not always possible using human subjects.

Selected Ion Flow Tube Mass Spectrometry (SIFT-MS) is a very rapid, sensitive technique for assuring fish and seafood freshness. With detection limits matching those of the human olfactory system, minimal sample preparation, and direct analysis, SIFT-MS is a very effective technique for detecting spoiling of seafood early, enabling wide-scale freshness screening.

Figures 1 and 2 show the results obtained for New Zealand groper and tarakihi. In both cases the concentration of trimethylamine, a compound with the characteristically “fishy” aroma of spoilage, increases significantly through the testing period. Ammonia, various sulfur

compounds, and oxygenates are also detected in the early stages of spoilage and increase as the samples age. Ethyl propionate, which is detected only in tarakihi, begins to decrease at six hours.

Mussels exhibit a very different headspace composition as they age (Figure 3). Their headspace is dominated by dimethyl sulfide, even at the initial measurement. A number of other major and minor components are also observed (Figures 3a and 3b), including trimethylamine. Ammonia exhibits unusual behavior in this instance, because the concentration decreases monotonically with increasing sample age.

This study demonstrates that SIFT-MS is extremely well suited to early detection of fish and seafood spoilage. The Syft Voice200ultra SIFT-MS instrument provides a robust, easy to operate solution for sensitive, quantitative screening of large numbers of samples per day, both manually and automatically (via autosampler integration).

Experimental Method

Samples of fresh fish (New Zealand groper and tarakihi) and shellfish (New Zealand green-lipped mussel) were purchased from retailers in Christchurch, New Zealand.

Triplicate samples of each product (25 grams) were placed in 250-mL Schott bottles and capped. They were allowed to warm to room temperature prior to the initial analysis (defined as "time zero" due to uncertainty in the actual age and history of samples). The bottles were then incubated at 37°C (Sanyo MIR-262 incubator) for the duration of the experiment, apart from the brief period of time that they were removed for analysis.

SIFT-MS Analysis

Instrument	Voice200
Inlet type	High performance
Sample flow	25 sccm
Software	Voice200 & LabSyft
Analysis type	Selected Ion Mode
Reagent ions	H ₃ O ⁺ , NO ⁺ , O ₂ ⁺
Compounds	Ammonia, dimethyl amine, trimethylamine, hydrogen sulfide, methyl mercaptan, dimethyl sulfide, dimethyl disulfide, formaldehyde, acetaldehyde, ethyl acetate, ethyl propanoate, acetic acid, ethanol
Analysis time	30 seconds
Typical LOD	50 pptv

Figure 1. SIFT-MS headspace concentrations of dominant spoilage compounds above groper at 37°C.

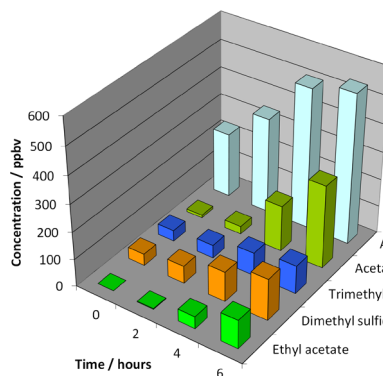


Figure 2. SIFT-MS headspace concentrations of dominant spoilage compounds above tarakihi at 37°C.

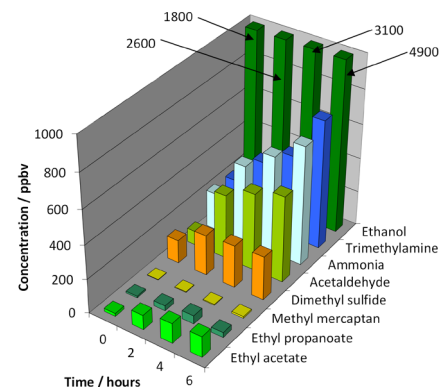
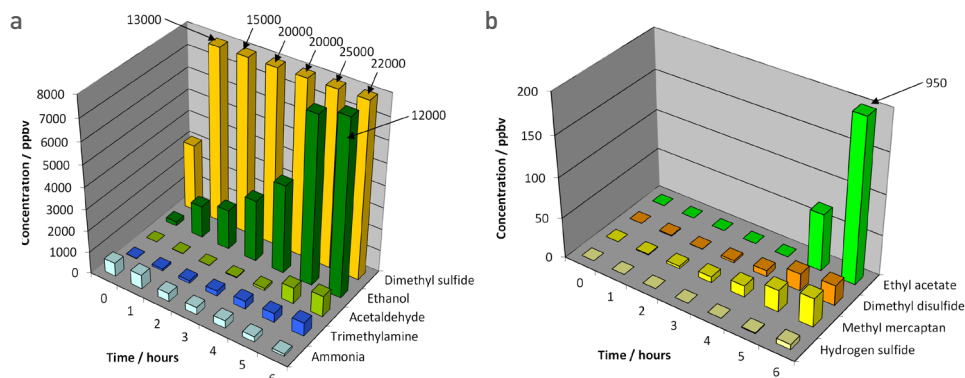


Figure 3. SIFT-MS headspace concentrations of various major (a) and minor (b) spoilage compounds above green-lipped mussels at 37°C.



Further Reading

Syft Brochure *SIFT-MS Technology Overview*

Syft Brochure *Food, Flavor & Fragrance Solutions*

Syft Brochure *Labsyft: Laboratory Software for SIFT-MS*

B.J. Prince, et al. (2010), "Application of [SIFT-MS] to real-time atmospheric monitoring", *Rapid Commun. Mass Spectrom.* **24**, 1763.

B. Nosedá et al. (2010), "Validation of [SIFT-MS] for Fast Quantification of Volatile Bases Produced on Atlantic Cod (*Gadus morhua*)", *J. Agric. Food Chem.* **58**, 5213.