

AUTOMATED FAMES ANALYSIS WORKBENCH

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INTRODUCTION

In response to EU legislative changes, the relevance of fatty acid composition determination has increased over recent years. Manual sample preparation for this analysis is laborious and exposes laboratory personnel to hazardous reagents. A fully automated workbench has been developed to handle all sample preparation and analysis steps required to determine the fatty acid composition of a range of sample types. A range of standardised methods have been widely implemented across Europe, and the workbench can be configured to accommodate multiple workflows running in parallel on a single robotic platform.





SYSTEM COMPONENTS

The FAMES workbench consists of a CTC PAL RTC robotic autosampler, and one or more GC-FID instruments. The PAL RTC configuration can be tailored to suit the number of GCs and the range of sample types. The configuration shown consists of a PAL RTC over 4 GC-FID instruments and automates multiple workflows to accommodate a range of sample types including raw fatty acid mixtures, triglycerides and amides.

The complete system is controlled by CHRONOS software. Data evaluation is done by any supported chromatography data system such as Openlabs, Clarity etc.

EXAMPLE AUTOMATED WORKFLOWS

The workbench can be configured to accommodate multiple workflows allowing the operator to present a range of raw sample types to the system and select from a list of automated sample preparation and analysis protocols. All subsequent steps such as transesterification, methylation, extraction, GC injection and result export/report generation are fully automated. Additional protocols such as automated preparation of calibration standards can also be accommodated on the same system. Some example sample preparation workflows are summarised below:

1. Sample Type: Fatty Acid Mixtures

- Known amount of sample presented to system
- Addition of acidic methanol
- Incubation at 60 degrees C
- Addition of n-Heptane
- Addition of saturated brine or water
- Injection into selected GC



2. Sample Type: Triglycerides

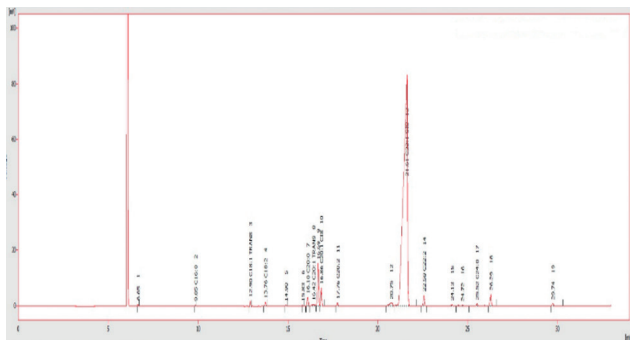
- Known amount of sample presented to system
- Addition of methanolic potassium hydroxide
- Incubation at 60 degrees C
- Addition of acidic methanol
- Incubation at 60 degrees C
- Addition of n-Heptane
- Addition of saturated brine or water
- Injection into selected GC



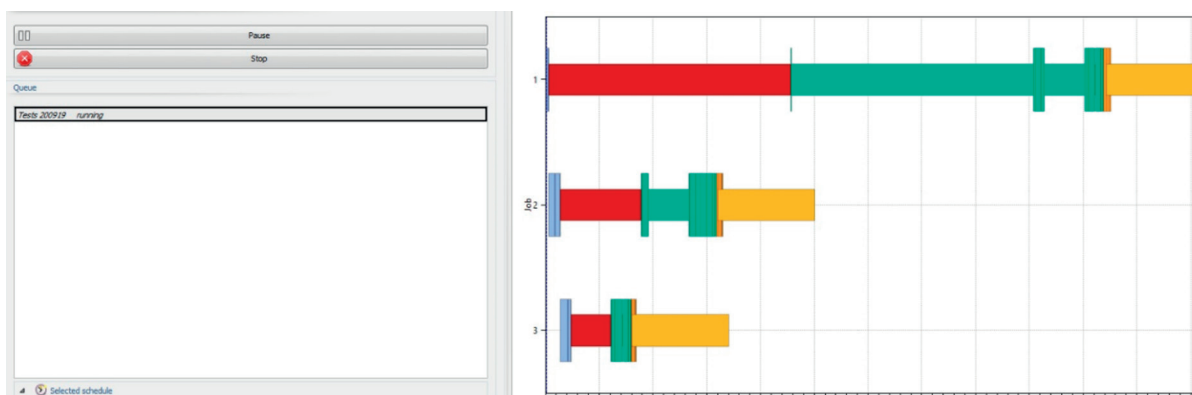
3. Sample type: Amides

- Addition of hydrochloric acid
- Incubation
- Transfer of sample of top layer to new vial
- Addition of acidic methanol
- Incubation at 60 degrees C
- Addition of n-Heptane
- Addition of saturated brine or water
- Injection into selected GC





Example results (Shimadzu GC-2014, 60m Column, constant pressure).



Fully overlapped sample prep and analysis of multiple sample types using multiple methods allows maximum productivity – overlap of protocols means that shorter sample prep protocols can be completed during incubation steps of longer protocols, for example.

The system pictured contains sample storage trays, wash stations, various syringe tools, solvent reservoir modules and heated agitator modules, but many more modules such as vortex mixers and centrifuges can be included in the configuration to facilitate automation of varied sample prep protocols.

Full control of multiple GC instruments is achieved by use of the PAL RTC with Chronos software. Optimised overlap of sample prep methods is achieved, even when samples are added to a sample list which is already in progress.

ADVANTAGES

- Reduced operator workload
- Increased efficiency
- Increased reproducibility
- Reduced volumes of reagents required
- Reduced exposure of laboratory personnel to hazardous reagents
- Ease of Use – the Chronos software provides a single, simple user interface for a complex, flexible system
- Flexibility - multiple workflows accommodated on one workbench
- Productivity – one PAL RTC can keep multiple GCs fully loaded with samples 24/7

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