Frying Fat Analysis with Agilent PLgel Columns and Gel Permeation Chromatography

Application Note

Food Testing and Agriculture

Authors

Greg Saunders and Ben MacCreath

Agilent Technologies (UK) Ltd

Essex Rd

Church Stretton

SY6 6AX

UK

Introduction

During the frying process, a wide variety of chemical reactions results in the formation of compounds with high molecular weight. The presence of air in the frying system and the heating of fats initiate a cycle of thermal and thermo-oxidative decomposition that results in the formation of polymeric compounds. The quality and properties of the fats are dependent on the levels of these higher molecular weight materials.

Gel permeation chromatography (GPC), which separates components based on molecular size in solution, provides an appropriate method for the quantification of such compounds in oils and fats.

Frying Oil Analysis

Typical separations of triglycerides from plant and animal sources are shown in Figures 1 and 2. The column type selected, Agilent PLgel 5 µm 100Å, has an exclusion limit of 4,000 molecular weight (polystyrene equivalent), and a guaranteed column efficiency of greater than 60,000 plates/m.

For peak detection, a conventional differential refractometer can be used (as shown in Figure 1). As an alternative, an evaporative light scattering detector can provide improved sensitivity and baseline stability to aid quantification (see Figure 2). An outline of the method and its validation has been published in an IUPAC paper [1].

Conditions for Figure 1

Columns	2 × Agilent PLgel 5 µm 100Å, 7.5 × 300 mm (p/n PL1110-6520)
Eluent	THF
Flow rate	0.5 mL/min
Detector	RI
System	Agilent PL-GPC 50

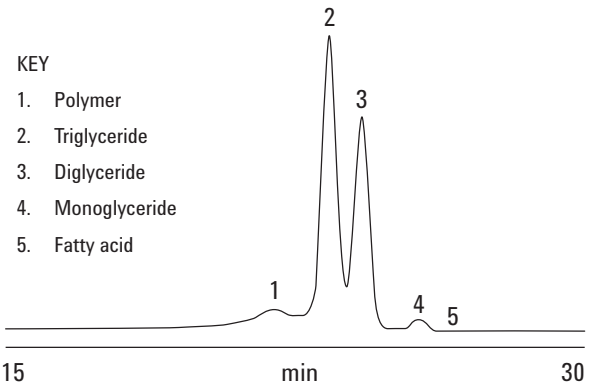

Figure 1. Fish oil analyzed on an Agilent PLgel 5 µm two-column set with refractive index detection.

Conditions for Figure 2

Columns	2 × Agilent PLgel 5 µm 100Å, 7.5 × 300 mm (p/n PL1110-6520)
Eluent	THF
Flow rate	0.5 mL/min
Detector	Agilent ELSD
System	PL-GPC 50

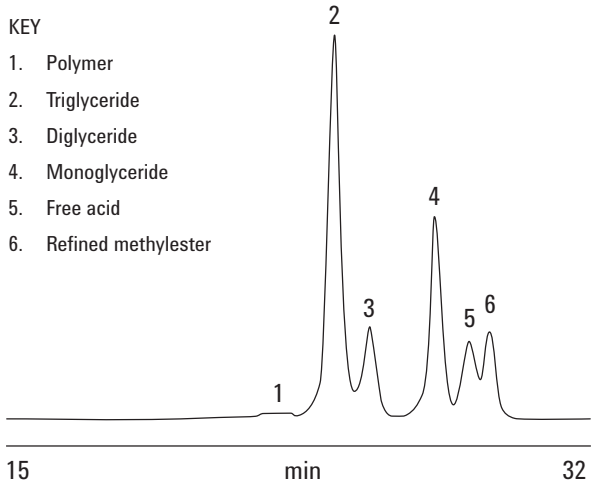

Figure 2. Grape seed oil separated on an Agilent PLgel 5 µm two-column set with evaporative light scattering detection to provide baseline stability and improved sensitivity compared to refractive index detection

Conclusion

Gel permeation chromatography with Agilent PLgel 5 µm columns is an appropriate method for quantifying triglycerides in frying oils. If peak detection is the main requirement a conventional differential refractometer is perfectly adequate. However, for quantification an Agilent evaporative light scattering detector improves sensitivity and baseline stability.

Reference

1 P. Wolff, F. X. Mordret, and A. Dieffenbacher (1991) Determination of polymerized triglycerides in oils and fats by high performance liquid chromatography. Pure and Applied Chemistry, 63, No 8, 1163-1171.

For More Information

These data represent typical results. For more information on our products and services, visit our Web site at www.agilent.com/chem.

www.agilent.com/chem

Printed in the USA
June 16, 2011
5990-8418EN

Agilent Technologies