

Analysis of Ethylene Carbonate and Ethyl Methyl Carbonate by GC/FID on a Thermo Scientific TraceGOLD TG-35MS Column

Bob Wiedemer, Thermo Fisher Scientific, Bellefonte, PA, USA

Abstract

Ethylene carbonate (EC) and ethyl methyl carbonate (EMC) are used as electrolytes in lithium-ion batteries. As such the quantitative analysis of these compounds is important to battery manufacturers. Reproducible peak areas and excellent peak shape for EC and EMC across multiple chromatographic runs were obtained on a TraceGOLD™ TG-35MS capillary GC column, an intermediate polarity 35 % diphenyl/65 % dimethyl polysiloxane phase.

Introduction

Ethylene carbonate (EC) and ethyl methyl carbonate (EMC) are used as electrolytes in lithium-ion batteries. Therefore the quantitative analysis of these compounds is important to battery manufacturers. Ethylene carbonate is also used as plasticizer, and as a precursor to vinylene carbonate, which is used in polymers and in organic synthesis. Sharp, symmetrical peak shapes are desirable for accurate and reproducible quantitative data.



Experimental Details

Chemicals and Reagents Part Number

Ethylene carbonate (EC); ethyl methyl carbonate (EMC)

Sample Handling Equipment Part Number

Vials and closures: 2 mL clear vial and Si/PTFE seal 60180-599

Separation Conditions Part Number

Instrumentation:	Thermo Scientific Focus GC with TriPlus Autosampler	
Column:	TraceGold TG-35MS, 30 m × 0.25 mm × 0.25 μm	26094-1420
Septum:	Thermo Scientific BTO 17 mm septa	31303211
Liner:	split/Splitless Liner with Siltek deactivation	453T2121
Column ferrules:	graphite ferrules to fit 0.25 mm id columns	29053488
Injection syringe:	10 μL, 50 mm Syringe	36500525

Carrier gas: helium

Column flow: 1.0 mL/min (constant flow mode)

Oven temperature: 100 °C (2.5 minute hold)-200 °C (4 minute hold) at 30 °C /minute

Injector type: split

Injector mode: split, split ratio: 70:1

Split flow: 70 mL/minute

Injector temperature: 200 °C

FID parameters:

Temperature: 250 °C

Air flow: 350mL/minute

Hydrogen flow: 35 mL/minute

Nitrogen makeup flow: 30 mL/minute

Key Words

- TG-35MS
- Ethylene carbonate
- Ethyl methyl carbonate

Solutions

Sample preparation: ECM/EC (70:30) diluted 2.2mg/1mL CH₂Cl₂

Data Processing

Software: ChromQuest

Results

Sharp, symmetrical peak shapes for EC and EMC, desirable for accurate and reproducible quantitative data, were obtained across multiple chromatographic runs on a TraceGOLD TG-35MS capillary GC column, an intermediate polarity 35 % diphenyl/65 % dimethyl polysiloxane phase. The peak area ratios obtained with five consecutive runs of the ECM/EC (70:30) sample was reproducible (see table below).

Ethyl Methyl Carbonate (ECM)/Ethylene Carbonate (EC)-70:30			
Run Number	Peak Area ECM	Peak Area EC	EC/ECM
1	6579920	2035819	0.309399
2	5923342	1847084	0.311831
3	6339728	1983810	0.312917
4	6512267	2026708	0.311214
5	669894	2093681	0.312539

Conclusions

Narrow, symmetrical peak shapes for EC and EMC were obtained.

Peak areas for EC and EMC consistent from run to run.

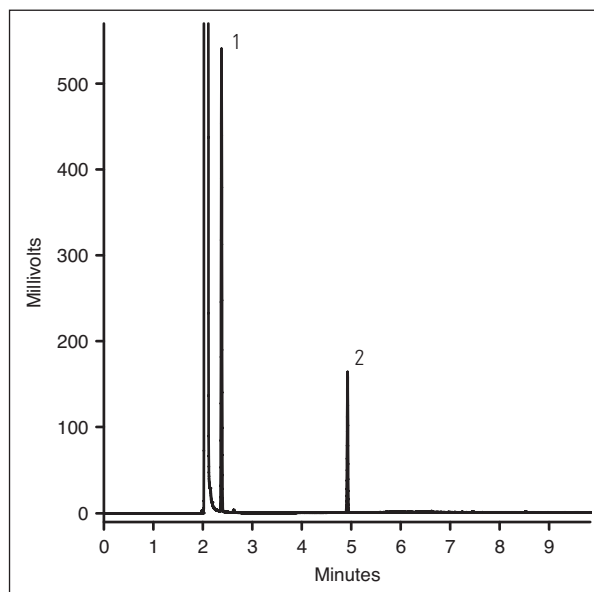


Figure 1: FID chromatogram of Teledyne ethylene carbonate sample on a TG-35MS column

Peak	Teledyne Ethylene Carbonate Sample	R _v /min
1	Ethyl methyl carbonate (EMC)	2.38
2	Ethylene carbonate (EC)	4.93

Table 1: Teledyne ethylene carbonate sample-Component retention times

In addition to these offices, Thermo Fisher Scientific maintains a network of representative organizations throughout the world.

**North America
USA and Canada**
+1 800 332 3331

**Europe
France**
+33 (0)1 60 92 48 34

Germany
+49 (0) 2423 9431 -20
or -21

United Kingdom
+44 1928 534110

**Asia
Japan**
+81 3 5826 1615

China
+86-21-68654588
or +86-10-84193588
800-810-5118

India
+91-22-6742 9494

**Thermo Fisher
Scientific Australia
Pty Ltd**
1300 735 292 (free call
domestic)

**Thermo Fisher
Scientific New
Zealand Ltd**
0800 933 966 (free call
domestic)

All Other Enquiries
+44 (0) 1928 534 050

Technical Support

North America
800 332 3331

**Outside North
America**
+44 (0) 1928 534 440

www.thermoscientific.com/chromatography

© 2012 Thermo Fisher Scientific Inc. All rights reserved. All trademarks are the property of Thermo Fisher Scientific Inc. and its subsidiaries. Specifications, terms and pricing are subject to change. Not all products are available in all countries. Please consult your local sales representative for details.

ANCCSETHCARTG 0212