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Title:	Characterization of Secondary organic aerosols (SOA) from oxidation of biogenic volatile organic compounds (VOCs) using stable isotopes.
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Form 836 (7/06)

Characterization of Secondary organic aerosols (SOA) from oxidation of biogenic volatile organic compounds (VOCs) using stable carbon isotopes.

2010 AGU Fall Meeting
Rebeka Fisseha Derseh

Introduction

- Secondary organic aerosols (SOA) contributes up to 70% of the total aerosol in the troposphere
- Biogenic Volatile Organic Carbon (VOC) accounts up to 90% of total VOCs emission in the atmosphere

Objectives

- To use stable isotopes as a tool to characterize secondary organic aerosols
- To understand the kinetic isotope effect of the oxidation of terpens with ozone

Stable Isotopes and Atmospheric Studies

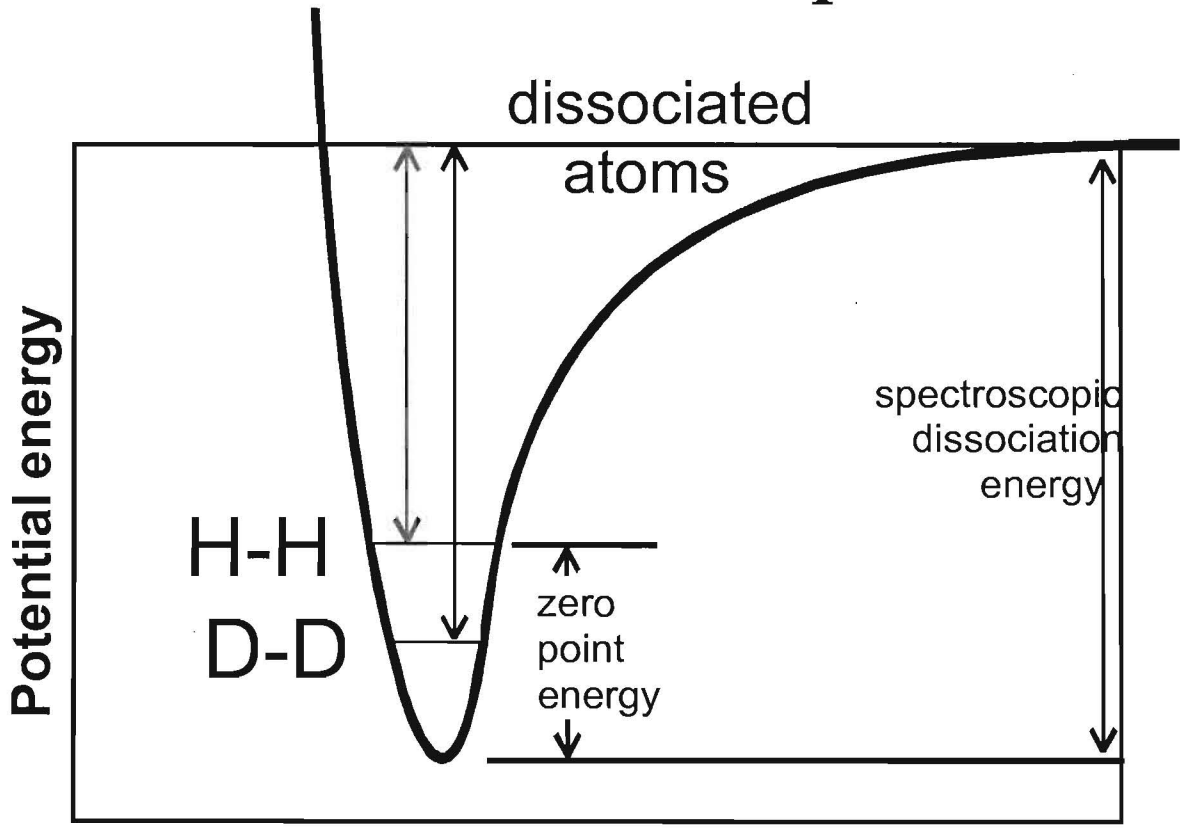
- Freshly emitted primary VOCs and particulate matter have a similar isotopic composition

- Secondary VOC have a significant difference in their isotopic ratio compared to their primary counterparts due to kinetic isotope effect (KIE) caused by atmospheric reactions

    - This difference can be measured and used to differentiate between primary emitted and secondary formed VOCs

- Stable isotopes can be used to study the chemical processing of an air mass

Kinetic Isotope Effect (KIE)



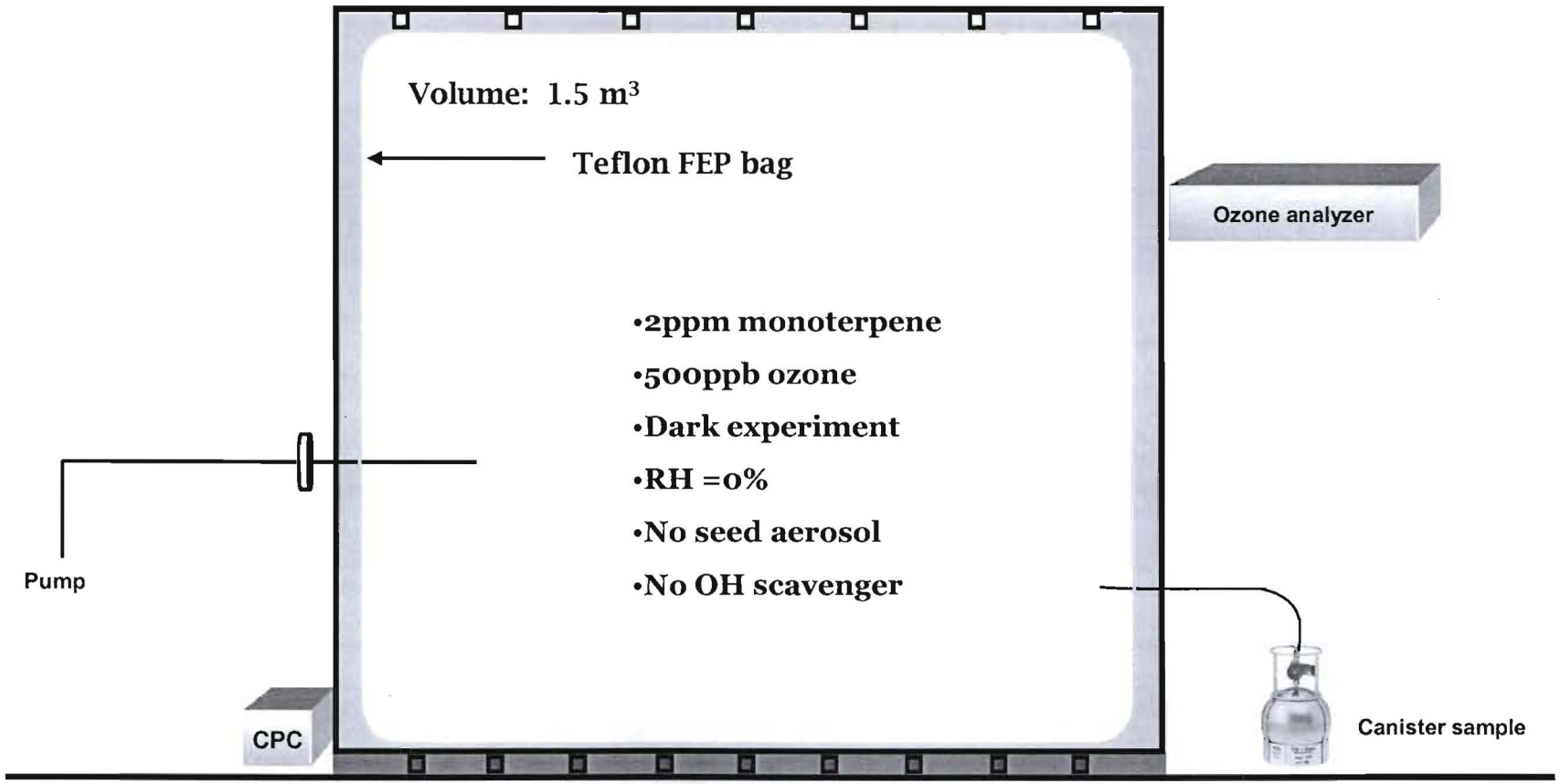
Fractionation

Leads to variation in isotope ratio R

R=13C/12C

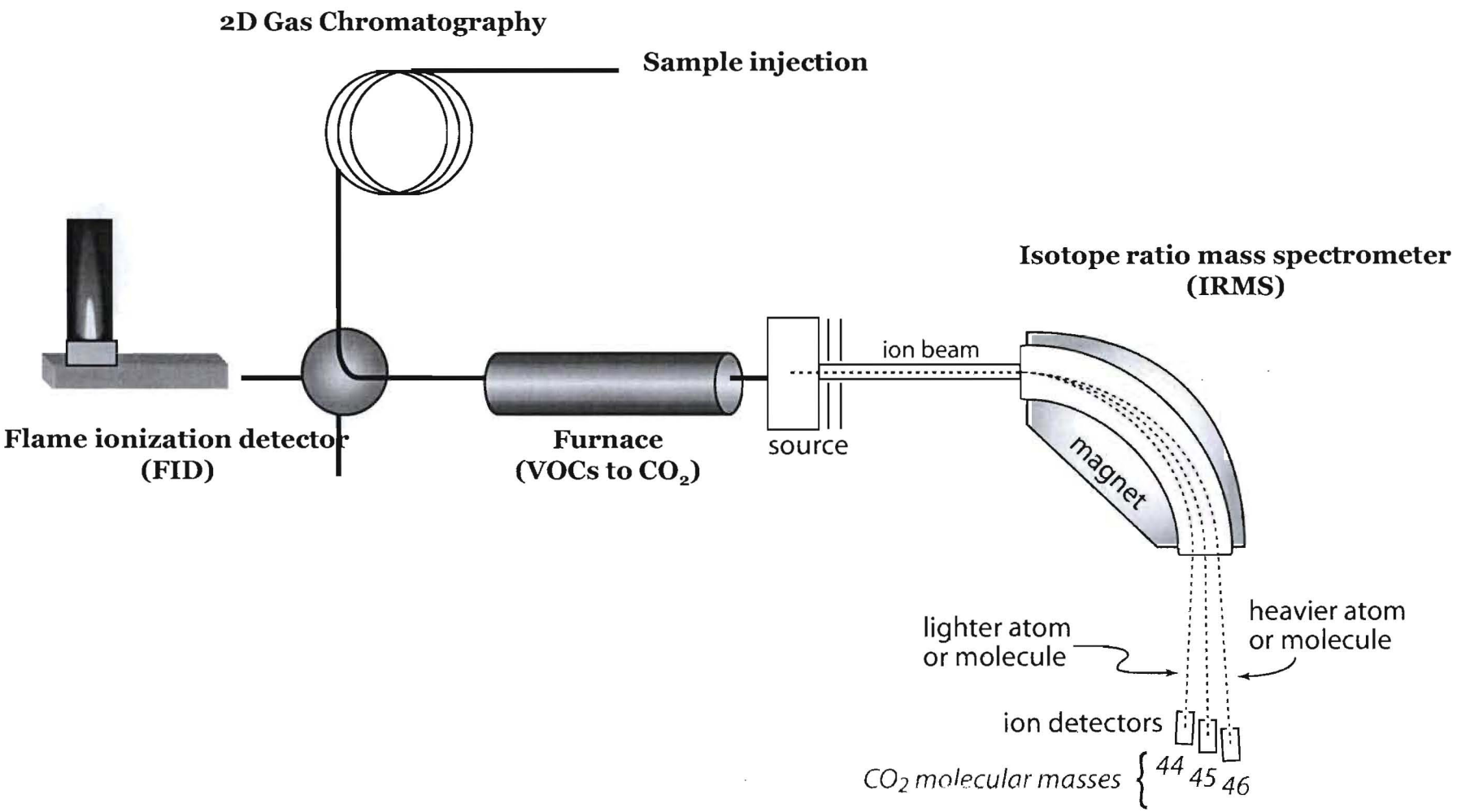
KIE =
K_{12}/K_{13}

The Indoor Chamber setup

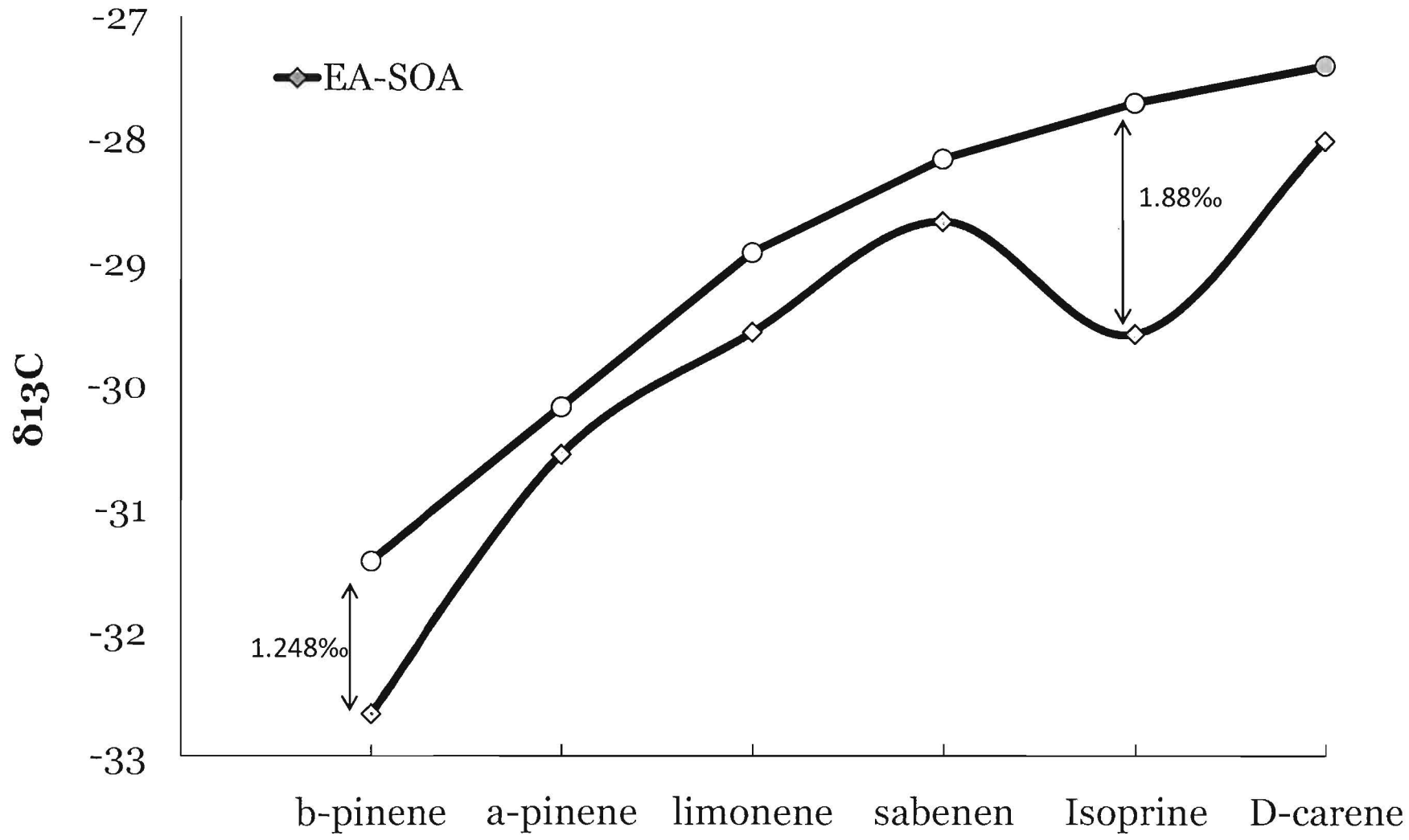


Mixing: Floor heater

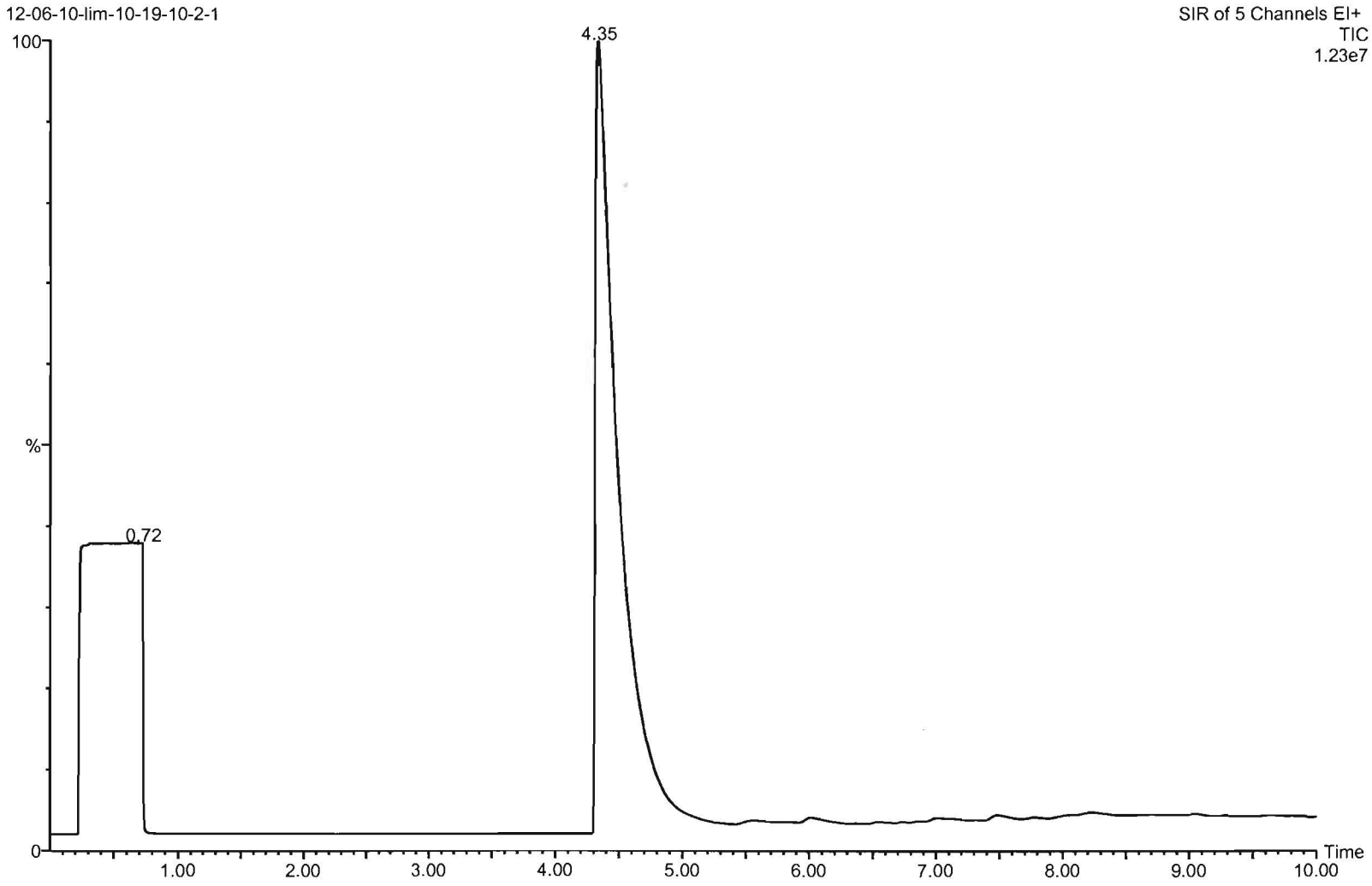
Experimental Setup



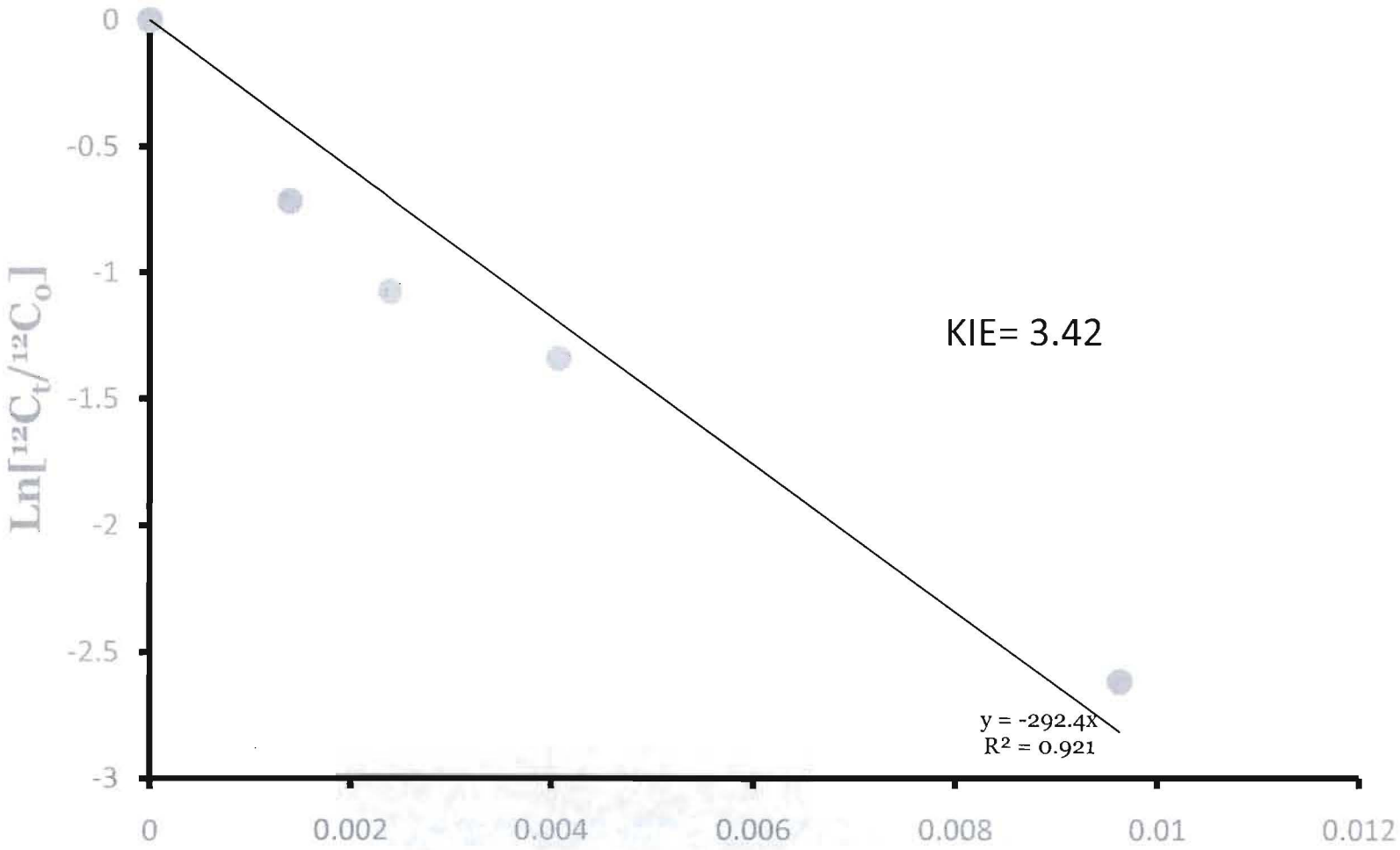
$\delta^{13}C$ of SOA



Compound specific isotopic analysis of SOA

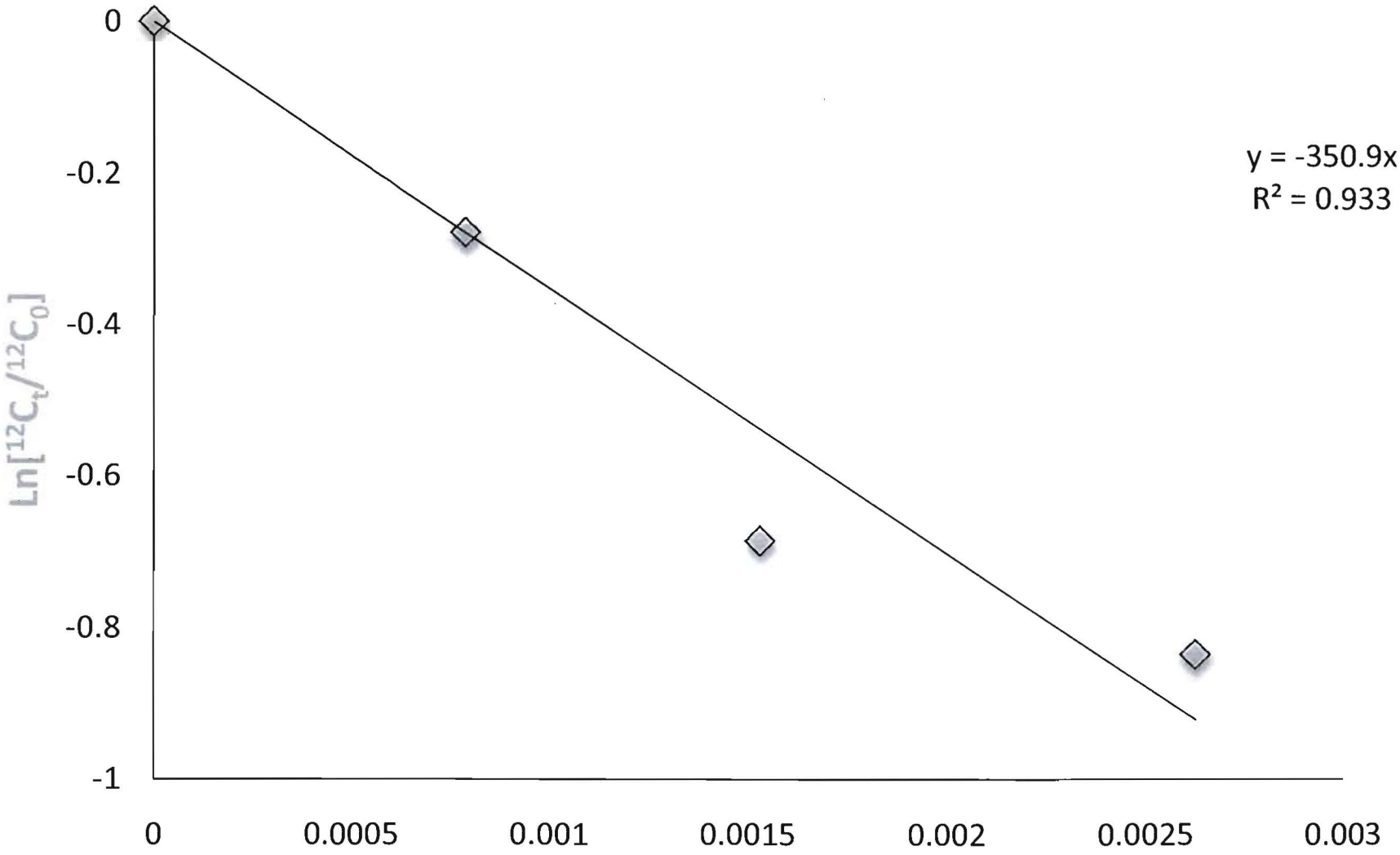


KIE for limonene



KIE= 3.42

KIE for alpha pinene



Conclusions

- KIE of the ozonolysis of limonene is calculated to be 3.4 ‰. However, this value may change for pure ozonolysis reaction.
- KIE of the ozonolysis of a-pneneis calculated to be 2.9 ‰. However, this value may change for pure ozonolysis reaction.
- Compound specific $\delta^{13}C$ measurement gives better insight on SOA fractionation than total carbon $\delta^{13}C$