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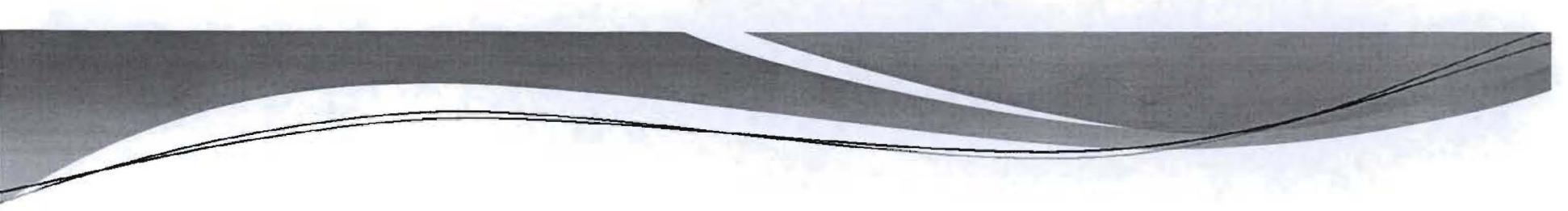
*Title:* Characterization of Secondary organic aerosols (SOA) from oxidation of biogenic volatile organic compounds (VOCs) using stable isotopes.

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# **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

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# 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

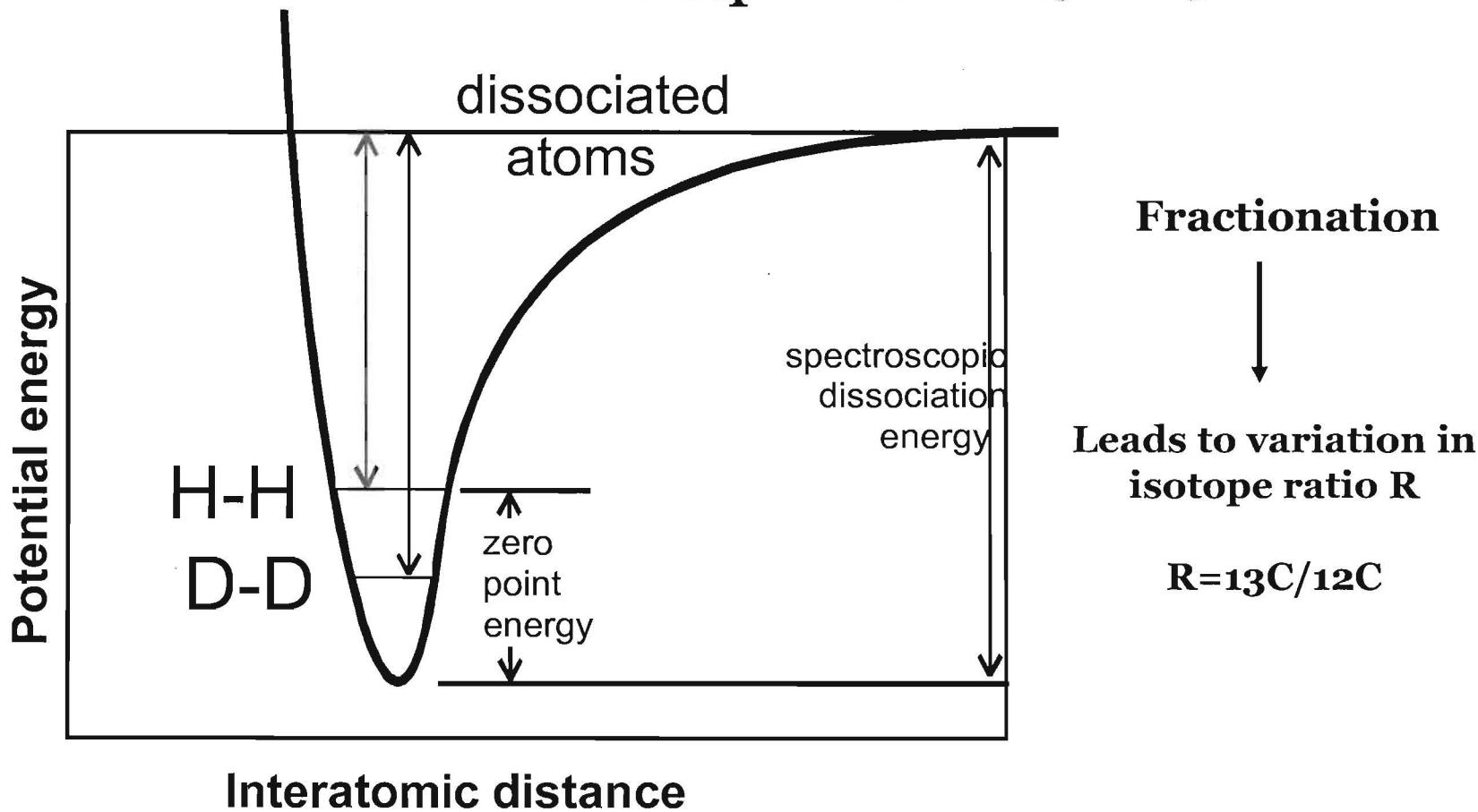
# Objectives

- 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

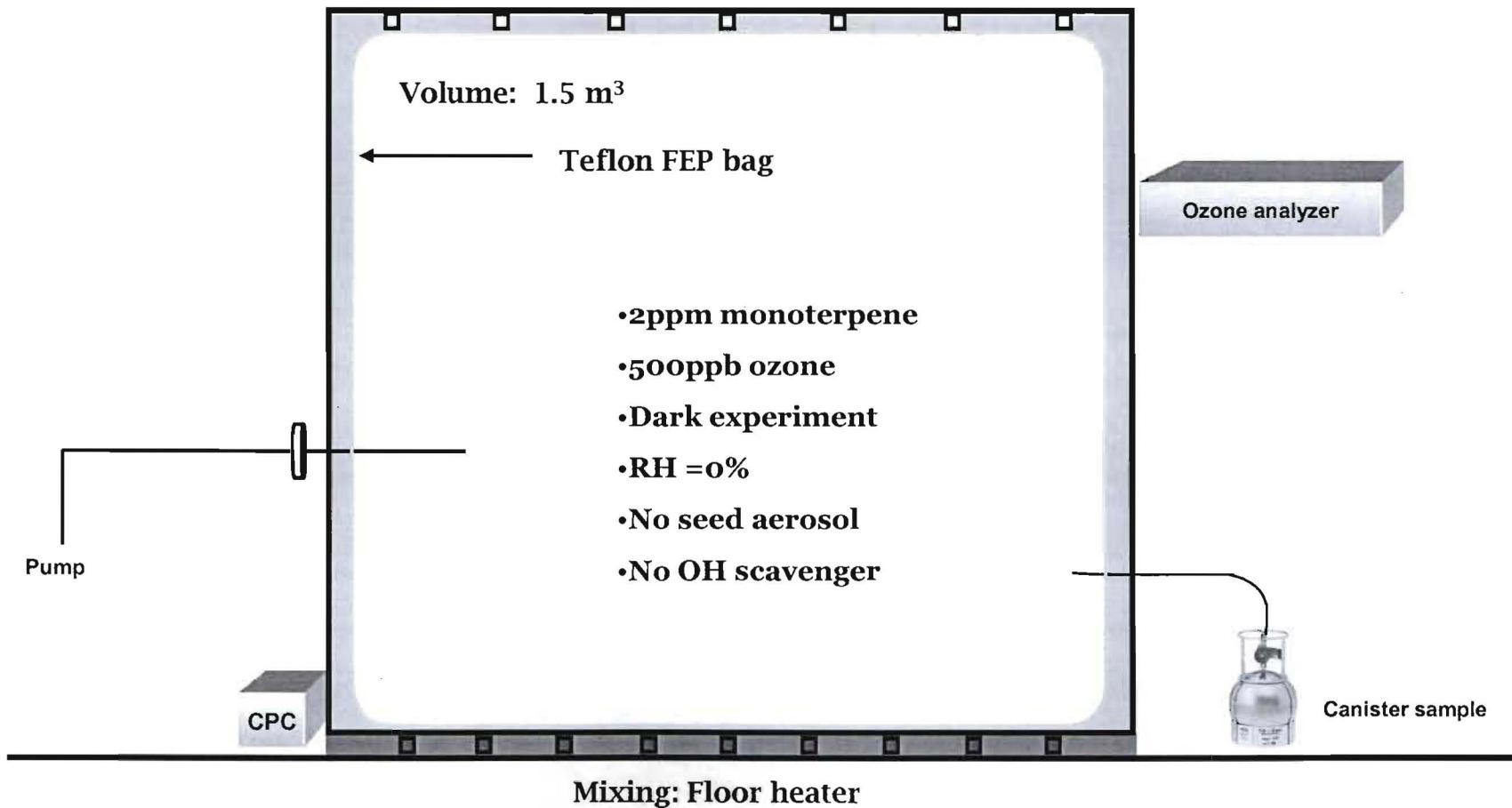
- Freshly emitted primary VOCs and particulate matter have a similar isotopic composition
- Secondary VOC have a significant difference in their isotopic ratio compared to their primary counterparts due to kinetic isotope effect (KIE) caused by atmospheric reactions
  - This difference can be measured 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)

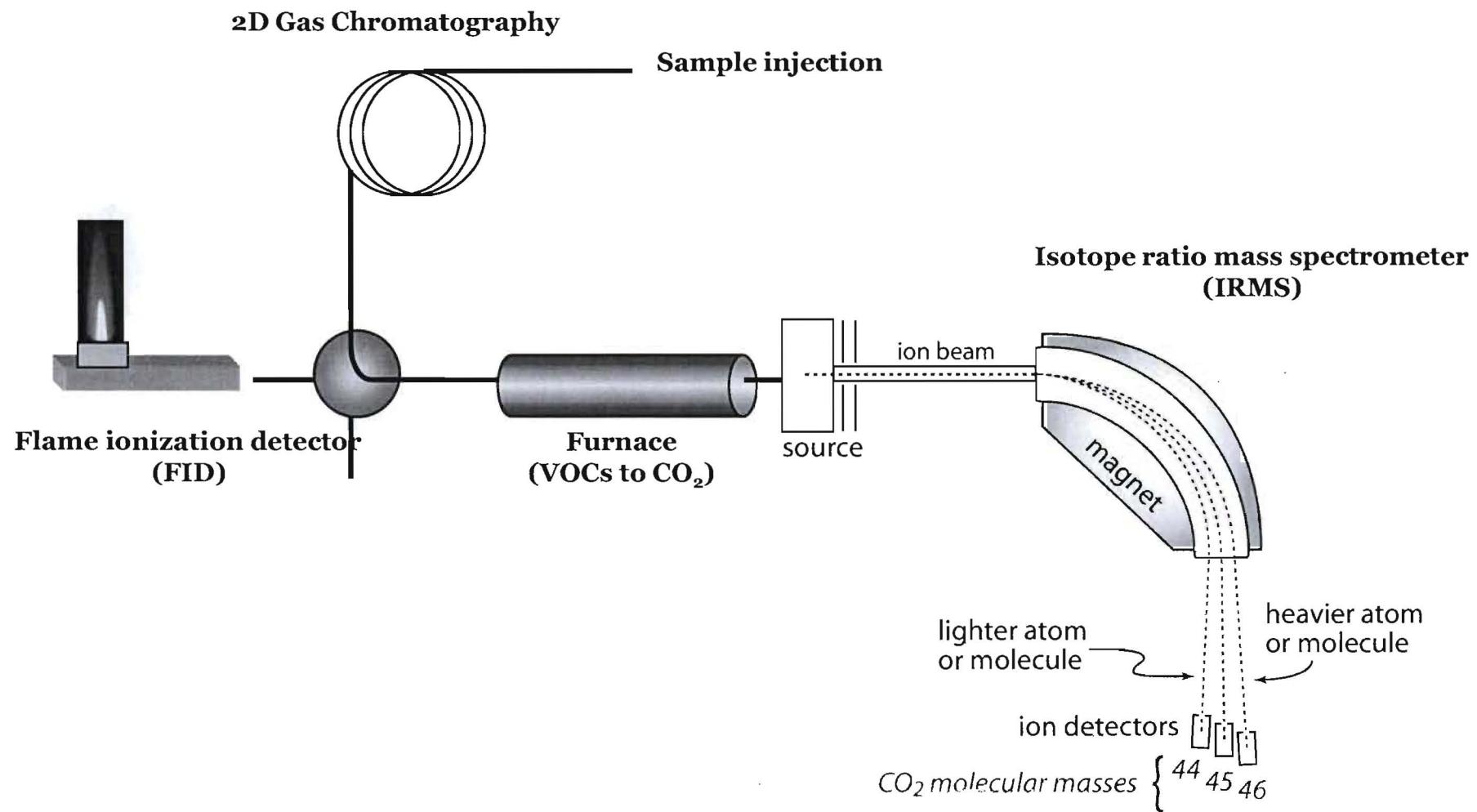


$$\text{KIE} = \frac{K_{12}}{K_{13}}$$

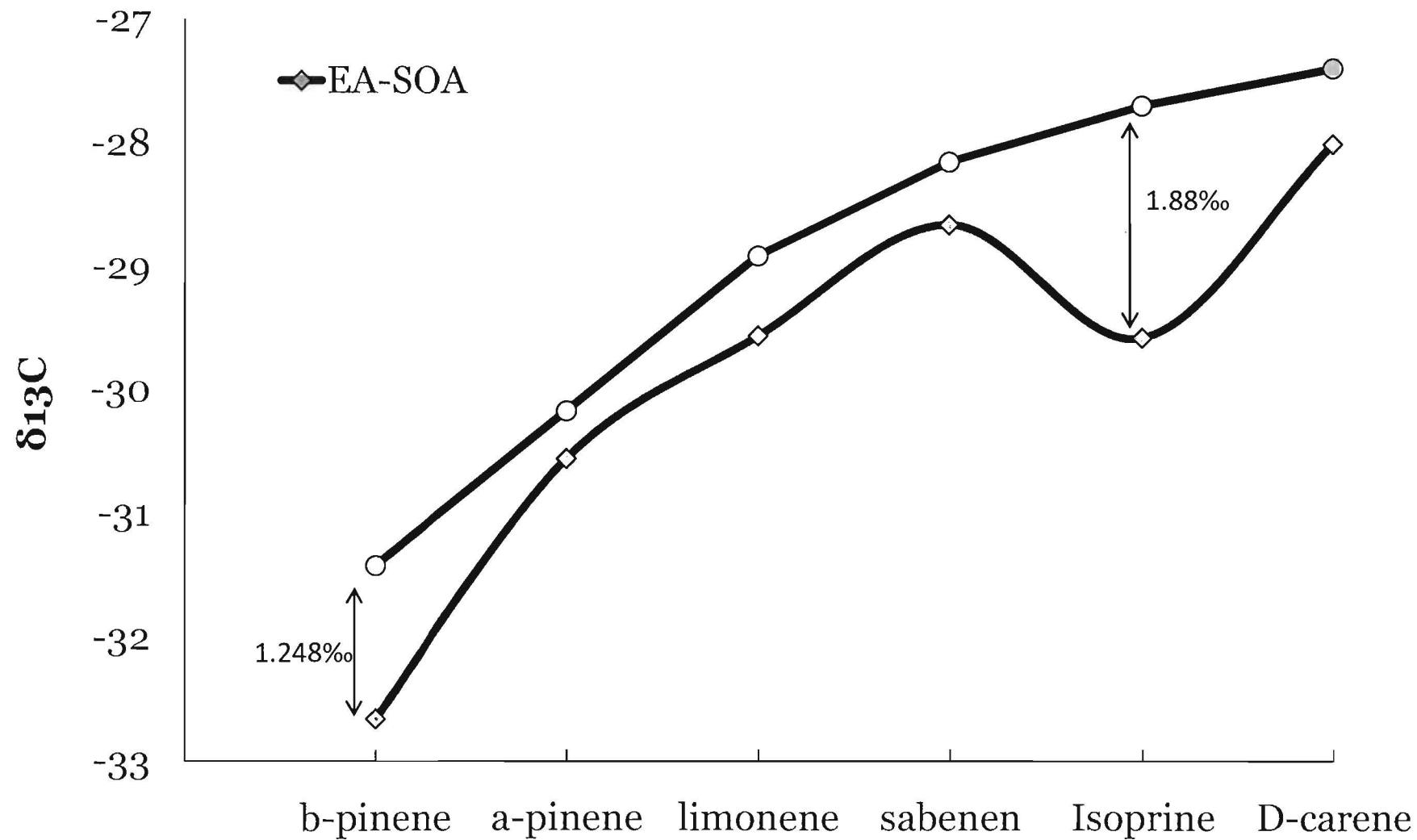
# The Indoor Chamber setup



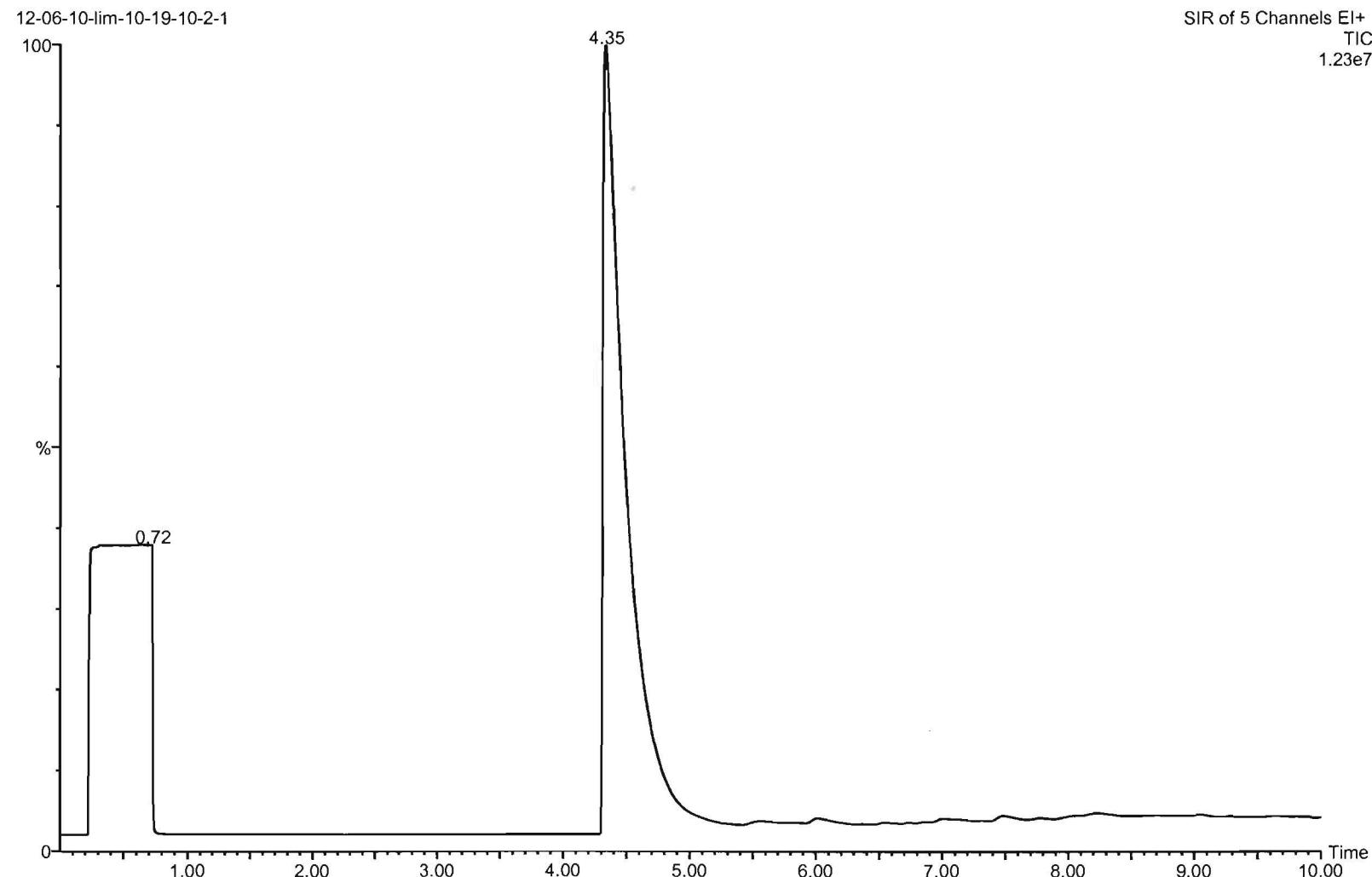
# Experimental Setup



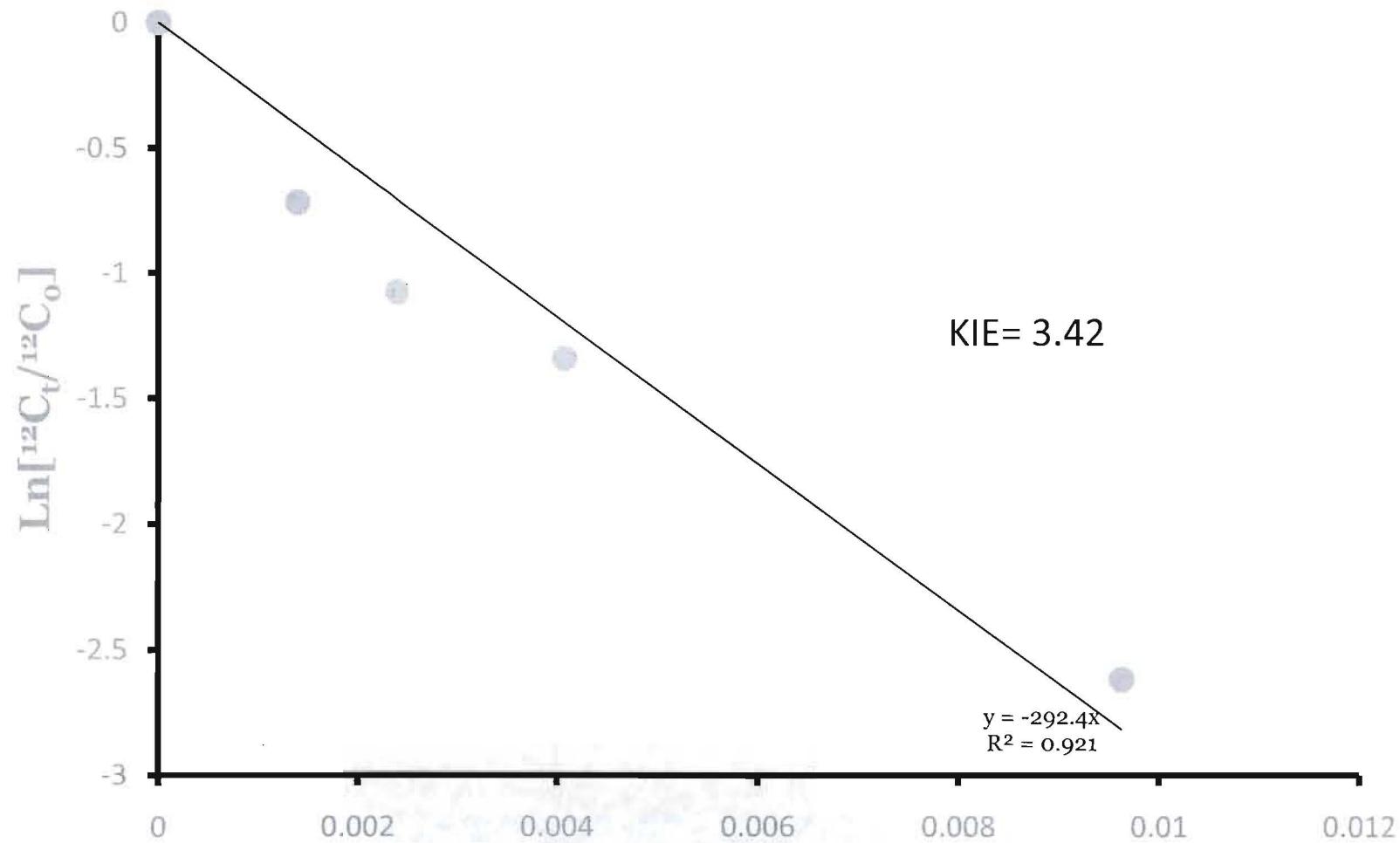
# $\delta^{13}\text{C}$ of SOA



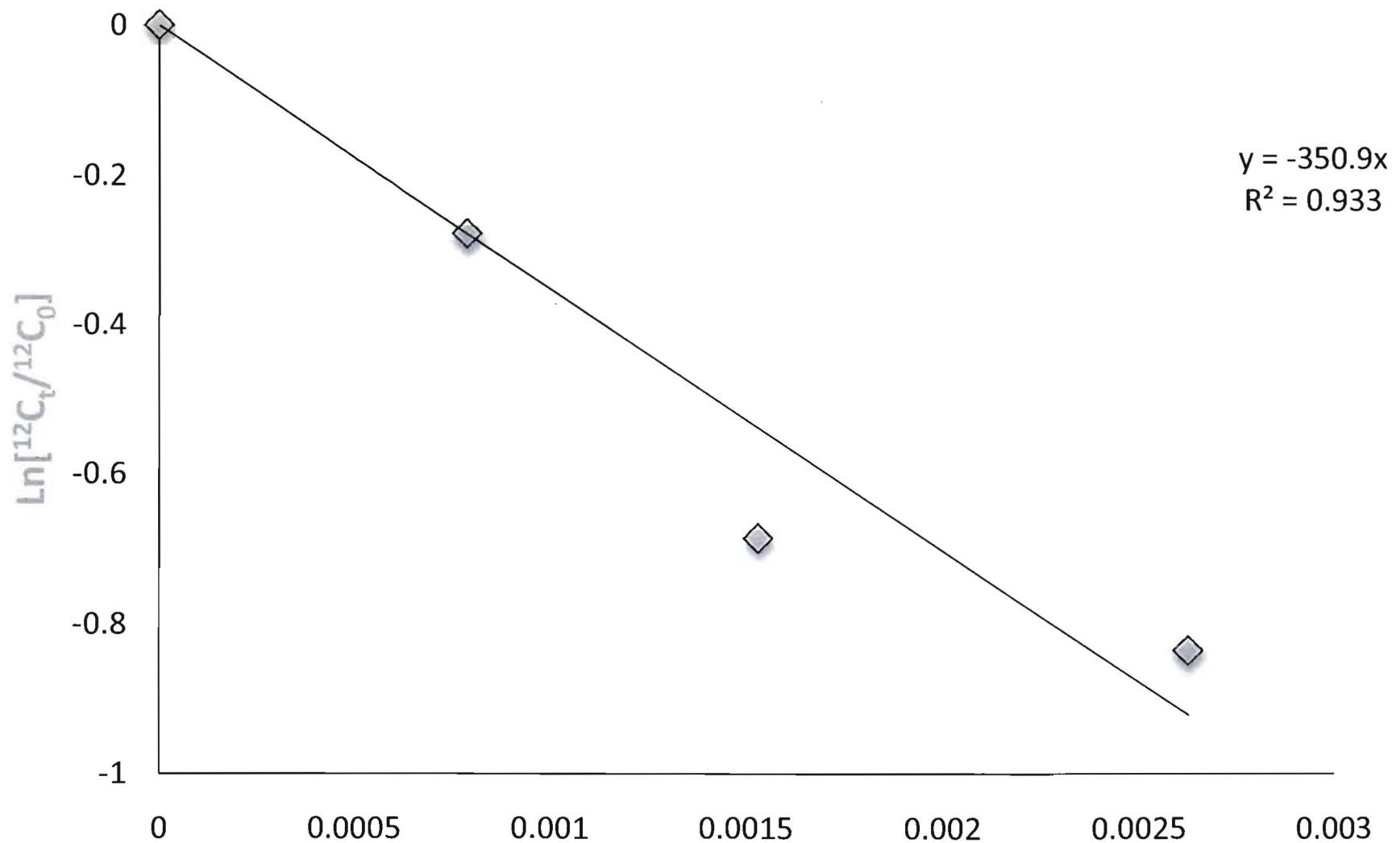
# Compound specific isotopic analysis of SOA



# KIE for limonene



# 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  $\alpha$ -pinene is calculated to be 2.9 ‰. However, this value may change for pure ozonolysis reaction.
- Compound specific  $\delta^{13}\text{C}$  measurement gives better insight on SOA fractionation than total carbon  $\delta^{13}\text{C}$