

AccuTOF-GCv Series

Analysis of Advanced Materials by FD/FI Part I

Polymer Building Blocks with Isocyanate and Piazole Groups

Introduction

Field Ionization (FI) is a soft ionization method that ionizes analytes by electron tunneling from analyte molecules to a solid surface (emitter) in a high electric field. The vaporized analyte molecules are introduced into the proximity of the emitter in order for ionization to occur. In this work, we analyzed functional monomers (building blocks for functional polymers) by GC/EI and GC/FI methods and then compared the resulting mass spectra.

Methods

Samples : Functional monomers with isocyanate and pilazole groups (Showa Denko K.K.)



(1) Karenz AOI® (C₆H₇NO₃)



(2) Karenz MOI® (C7H9NO3)



(3) Karenz BEI® (C₁₁H₁₃NO₅)



(4) Karenz MOI-BP® (C₁₂H₁₇N₃O₃)

GC conditions	
Column:	ZB-5ms, 30 m x 0.25 mm, film
	thickness: 0.25 µm
Carrier gas:	Helium, 1.0 mL/min (constant
	flow rate mode)
Oven:	$40 ^{\circ}\text{C} (2 \text{ min}) \rightarrow 30 ^{\circ}\text{C/min} \rightarrow$
	280 °C (12 min)
MS conditions	
Mass spectrometer:	JMS-T100GC "AccuTOF GC"
Ionization mode:	EI: Electron energy: 70 eV,
	Ionization current: 300 µA

FI: Cathode potential: -10 kV,

Emitter current: 0 mA Acquired mass range: m/z 35 - 550Spectral recording interval: 0.4 sec

Results and Discussion

Karenz AOI®, MOI®, BEI® have isocyanate groups, and MOI-BP® has a pyrazole group. These types of molecules fall apart during EI analysis to produce a number of fragment ions and no molecular ions in the mass spectrum, as shown in Fig. 1(a) and (c) and Fig. 2(a) and (c). However, the FI method clearly showed the presence of molecular ions for each sample tested, as shown in Fig. 1(b) and (d) and Fig. 2(b) and (d). As this work demonstrates, the FI method is suitable for the analysis of highly reactive and labile compounds such as the ones tested in this work.

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Applications Note

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