

CDSolutions

APPLICATIONS INFORMATION USING ADVANCED SAMPLE HANDLING TECHNOLOGY

Pyrolysis of Fluoropolymers Polyvinyl Fluoride vs. Polyvinylidene Fluoride

As a general rule, vinyl polymers undergo a degradation mechanism called side-group elimination when they are pyrolyzed. Polyvinyl Fluoride, for example, has a fluoride on every other carbon. During pyrolysis, fluorine dissociates with the neighboring hydrogen, forming hydrogen fluoride, and leaving an unsaturated backbone. This backbone stabilizes by forming aromatics (Figure 1).

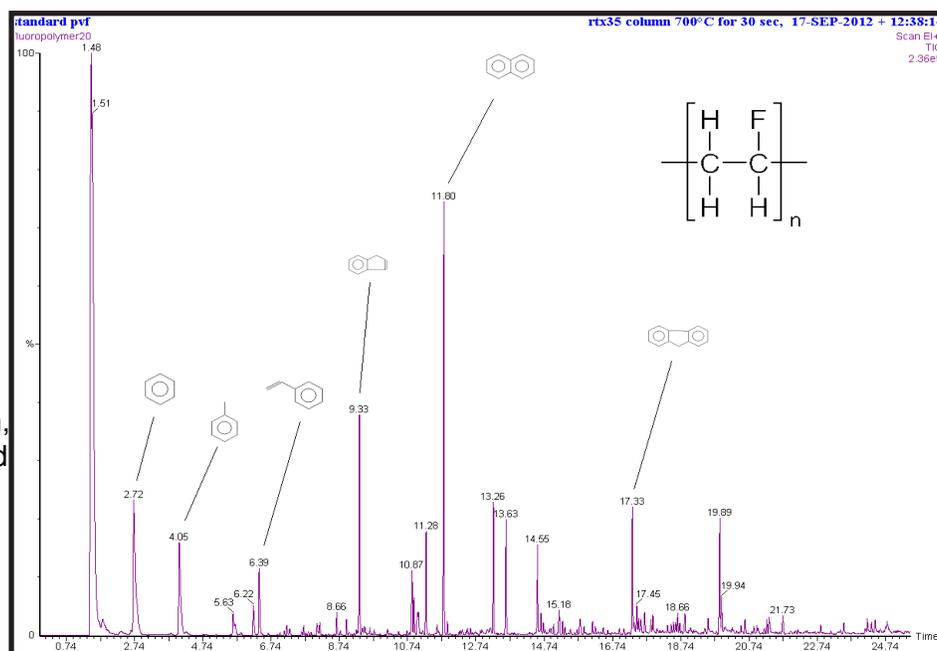


Figure 1: Pyrolysis of Polyvinyl Fluoride at 700°C

Polyvinylidene Fluoride, has not one, but two fluorides on every other carbon. Therefore, when one fluoride dissociates, another fluoride remains on the carbon backbone. When this backbone forms aromatics, they are fluorinated (Figure 2).

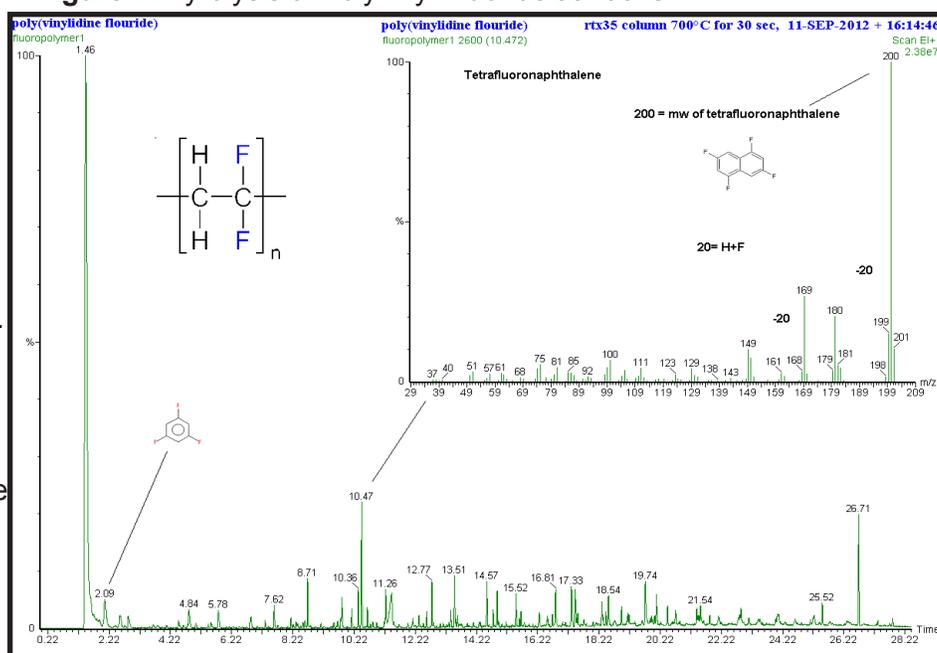


Figure 2: Pyrolysis of Polyvinylidene Fluoride at 700°C

Please be aware that HF gas is very reactive, and will cause destruction of silicon consumables like injection port liners and columns over time.

Equipment

CDS Model 5200 Pyroprobe interfaced to a Gas Chromatograph/Mass Spectrometer.

Model 5200 Conditions

Valve Oven: 350°C
Transfer Line: 310°C

Pyroprobe:

Initial: 0°C .00 Seconds
Ramp: 0.00°C per mSec
Final: 700°C 30.00 Seconds

Interface:

Rest: 50°C
Initial: 50°C 0.00 Minutes
Ramp: 0.00°C per Minute
Final: 300°C 3.00 Minutes

GC/MS Conditions

Carrier: Helium
Injector: 280°C
Split: 50:1
Column: RTX35 (30M 0.25mmID 0.25um df)
Detector: Quadrupole Mass Spectrometer
Range: 35-600amu

GC Program:

Initial: 40°C for 2 minutes
Ramp: 10.0/min
Final: 325°C for 9.50 min

FOR MORE INFORMATION
CONCERNING THIS APPLICATION,
WE RECOMMEND THE
FOLLOWING READING:

T. Isemura, Y. Jitsugiri, S. Yonemori, Journal of Analytical and Applied Pyrolysis, 33 (1995) 103-109.

T. Szekely, G. Varhegyi, F. Till, P. Szabo, E. Jakab, Journal of Analytical and Applied Pyrolysis, 11(1987)83-92.

J. Lonfei, W. Jingling, X. Shuman, Journal of Analytical and Applied Pyrolysis, 10(1986)99-106.

Additional literature on this and related applications may be obtained by contacting your local CDS Analytical representative, or directly from CDS at the address below.

CDS Analytical, Inc. has been a leader in the design and manufacture of laboratory instruments for sample preparation and analysis since 1969. We are dedicated to providing the best possible instruments for both research and routine analysis. Well known in the field of pyrolysis, CDS manufactures the Pyroprobe® 5000, 5150, 5200 and 5250 autosampler for the introduction and analysis of solid materials by GC, MS and FT-IR. CDS offers a complete line of dynamic headspace instruments for the analysis of volatile organic compounds in environmental, pharmaceutical and food applications, including the model 8400 four-position autosampler. CDS also manufactures the Dynatherm line of thermal desorption instruments including the 9000 series for air monitoring and the 9300 TDA. Our customers, their requirements and applications are important to us. To help meet your needs, we offer a wide range of analytical information and the services of our applications laboratory. If you would like additional information, please contact us at the address below, call us at 1 800 541 6593, or log onto www.cdsanalytical.com.