

Pyrolysis of Fluoropolymers Polyvinyl Fluoride vs. Polyvinylidene Fluoride

Application Note Pyrolysis Theory

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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).

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).

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

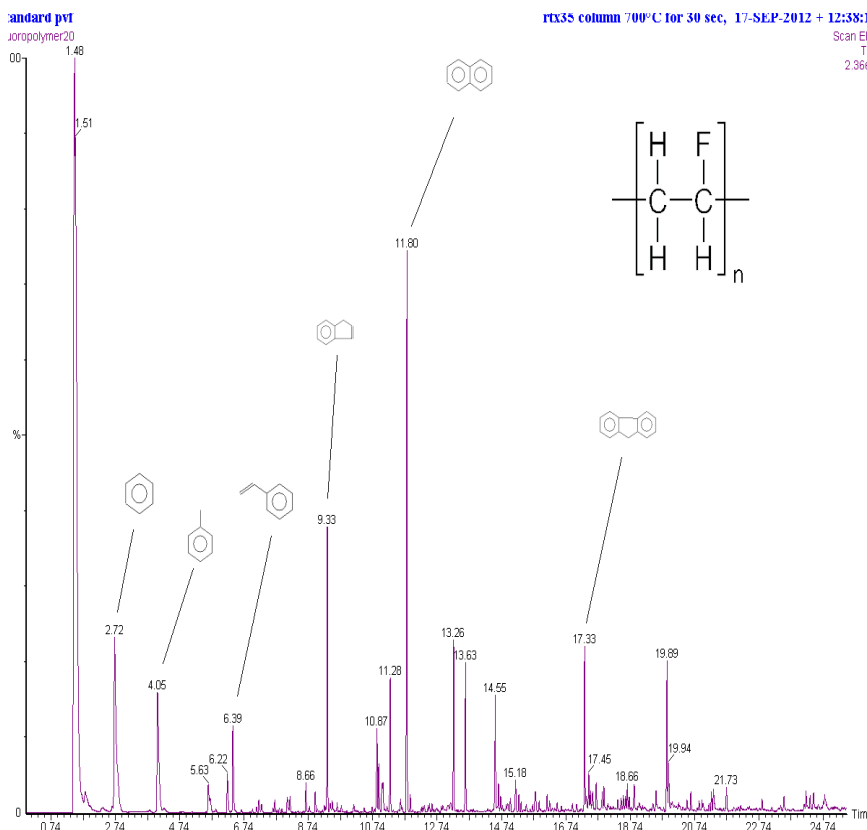


Figure 1: Pyrolysis of Polyvinyl Fluoride at 700°C.

Instrument Conditions

Pyroprobe

Pyrolysis: 700°C 30 seconds
Interface: 300°C for 3 minutes

Valve Oven: 325°C
Transfer Line: 325°C

GC/MS

Column: 35% phenyl (30m x 0.25mm x 0.25µm)
Carrier: Helium, 50:1 split
Injector: 280°C
Oven: 40°C for 2 minutes
10°C/min to 325°C hold 9.5 min
Mass Range: 35-600 amu

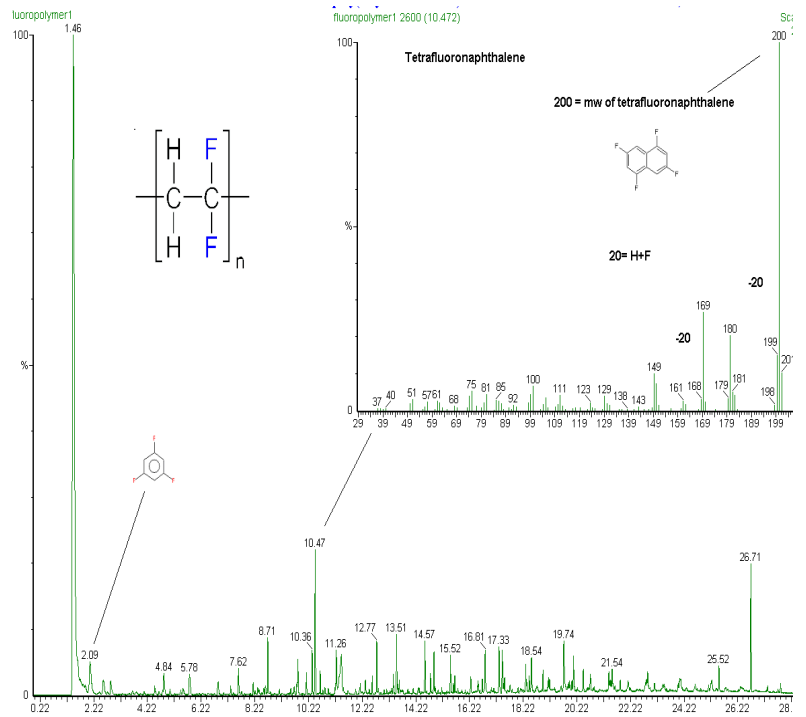


Figure 2: Pyrolysis of Polyvinylidene Fluoride at 700°C.

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.