[III~23]

CHARACTERIZATION OF POLYSTYRENES AND SUBSTITUTED POLYSTYRENES USING TOF-SIMS

Yeonhee Lee, Seunghee Han, Jung-Hye Lee, Jung-Hyeon Yoon, HyunEui Lim[†]
Advanced Analysis Center, Korea Institute of Science & Technology
[†]Department of Chemistry, Korea University

Polystyrenes are used widely as packaging and insulating materials, and understanding how thermal and radiation-induced changes affect them is important. Studies of polymer ion formation and fragmentation in mass spectrometry have been done to investigate the mechanisms of polymer degradation.

A variety of mass spectrometric methods have been used for characterization of styrene polymers. Laser desorption and field desorption mass spectrometry have successfully obtained fingerprint information in the low mass range and oligomer intensity distribution for low molecular weight polymers. Pyrolysis GC-MS and quadrupole SIMS studies have been limited to the fingerprint region by mass analyzers used.

Secondary ion mass spectrometry in combination with time-of-flight mass analyzer (TOF-SIMS) has been widely used to characterize the synthetic polymers. The purpose of this investigation was to characterize decomposition and fragment ion formation for polystyrenes and substituted polystyrenes, induced by cesium kiloelectronvolt ion bombardment. Positive and negative ion mass spectra of various polystyrenes were recorded using TOF-SIMS. High resolution TOF-SIMS has been applied to structural characterization and surface analysis of a series of polystyrenes.

Beside desorption of intact oligomer ions, fragmentation of the substituted polystyrene chain was observed. TOF-SIMS spectra of different molecular weight polystyrenes, poly(α-methylstyrene), poly(4-methylstyrene), poly(4-tert-butylstyrene), poly(4-chlorostyrene), poly(vinyl benzylchloride), poly(4-vinyl biphenyl), and poly(vinylnaphthalene) were obtained using TOF-SIMS. The molecular weight results from TOF-SIMS spectra are in good agreement with Gel Permeation Chromatography (GPC).