



Analysis of Antioxidants in Acrylonitrile Butadiene Rubber (NBR) Part 1 : Study of Thermal Extraction by Evolved Gas Analysis (EGA)

When additives in polymer materials are analyzed by instant pyrolysis, interferences from thermal decomposition of polymer backbone are often seen on the pyrogram, in addition, thermal decomposition of additives can also degrade the quality of the analysis. Thermal desorption technique can solve these problems. Described here is quantitative analysis of commonly used antioxidants for NBR, i.e., NOCRAC 810-NA and NOCRAC 6C (chemical structures and mass spectra shown below). Conditions for thermal desorption must first be determined. Evolved gas analysis is an excellent tool for this purpose. Shown in Fig. 2A is an evolved gas curve (TIC) of NBR obtained by programmed heating from 50°C to 600°C. A broad peak (A-1) in 120~320°C range arising from volatile components of the additives and a peak (A-2) in 320~520°C range from the decomposition of polymer were observed. Mass chromatograms of characteristic ions for NOCRAC 810-NA and NOCRAC 6C are shown in Fig. 2B, showing clearly that these were all eluted off below 350°C. Based on the results, the thermal desorption condition was determined to be 100°C 10°C/min 350°C (5min). The following report (PYA-005) will describe quantitative analysis by employing the thermal desorption condition obtained here as well as the reproducibility.

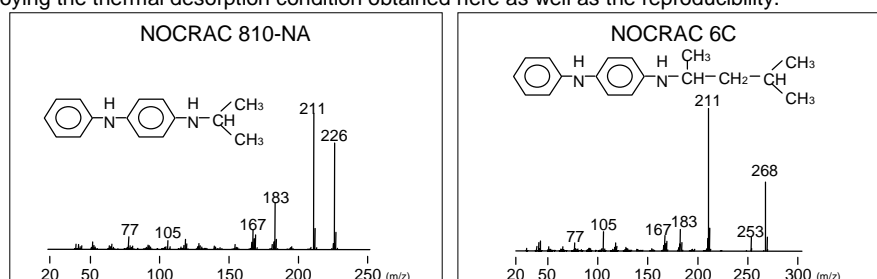


Fig. 1. Chemical Structures and Mass Spectra of Antioxidants

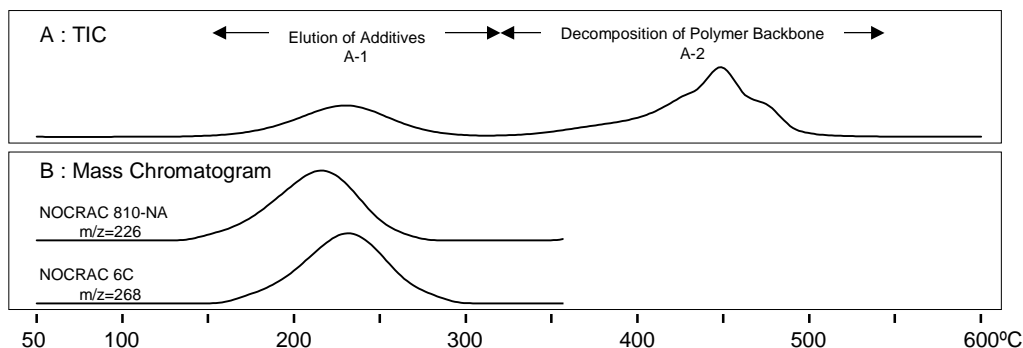


Fig. 2. Evolved Gas Analysis of NBR

Pyrolysis temp. : 50°C 600°C (10 /min) Carrier gas : He 50kPa, 60ml/min, Split ration : ca. 1/50
EGA tube : 0.15mm id, 2.5m (UADTM-2.5N), GC oven temp. : 300°C, Injection temp. : 320°C, Sample : ca. 0.5mg,
Detector : MS, Scan range : m/z=29-400, Scan rate : 0.1 Scans/sec, Py-GC interface temp. : 320°C (AUTO mode)

Keyword : NBR, Thermal Desorption, Quantitative Analysis, Additives, Antioxidant, NOCRAC 810-NA, NOCRAC 6C, Evolved Gas Analysis

Application : General Polymer Analysis, Rubber Related Industry

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