[TECHNOLOGY BRIEF]

Xevo TQD and Atmospheric Pressure Photo Ionization (APPI) for the Detection of Diverse Polymer Additives

GOAL

To demonstrate the applicability of Atmospheric Pressure Photo Ionization (APPI) with the Xevo® TQD for the analysis of a range of widely used polymer additives.

BACKGROUND

In their day-to-day activities, analytical laboratories encounter a wide range of structurally diverse molecules with varying physicochemical properties. The ability to rapidly, easily, and accurately analyze all these molecules using a single instrument platform offers analytical businesses the opportunity to streamline their workflows and affords a valuable competitive advantage.

The Xevo TQD MS is equipped with Waters® universal Xevo source housing. This provides analysts with quick and simpleaccess to diverse interface technologies with which to approach their daily analytical challenges. Along with APPI, other techniques include Atmospheric Pressure Gas Chromatography (APGC), Atmospheric Pressure Solids Analysis Probe (ASAP), combined ElectroSpray-Atmospheric Pressure Chemical Ionization (ESCi®), or NanoFlow™ Technologies.

Many industries, including the polymer and petrochemical industries, frequently encounter molecules that cannot easily be ionized using the typical technique of choice for mass spectrometry, ElectroSpray Ionization (ESI). However, APPI is well suited for the analysis of diverse molecular structures, and it is particularly applicable to highly organic, non-polar species. APPI is the ideal choice for analyzing compounds, such as polymers and polymer additives, and it is equally effective at ionizing low mass and high mass species.

The Xevo TQD with flexible source options, such as APPI, offers comprehensive compound coverage for diverse routine analyses.

THE SOLUTION

A Xevo TQD Mass Spectrometer fitted with an APPI source, coupled to an ACQUITY UPLC System were used for the simultaneous analysis of 10 different polymer additives. The Xevo TQD was operated in MRM mode to ensure maximum sensitivity and selectivity for the compounds of interest.

The ionization process in APPI can be enhanced by a substance known as a dopant. The dopant is usually an organic solvent that is readily ionized by the vacuum-UV lamp, which can then react to ionize the analyte of interest. In this analysis, the dopant was acetone, which was incorporated into the mobile phases.

The additives analyzed include an anti-static agent, a clarifying agent, a plasticizer, a PVC softener, an optical brightener, UV absorbers, and antioxidant stabilizers. Their molecular masses ranged from 226 Da for Tinuvin P, to 647 Da for Irgafos 168. The MRM data were processed using TargetLynx™ Application Manager. Figure 1 shows the chromatograms obtained for the simultaneous analysis of a mix of the 10 polymer additives. We can clearly see good responses for every compound, indicating that they all were readily ionized using APPI.

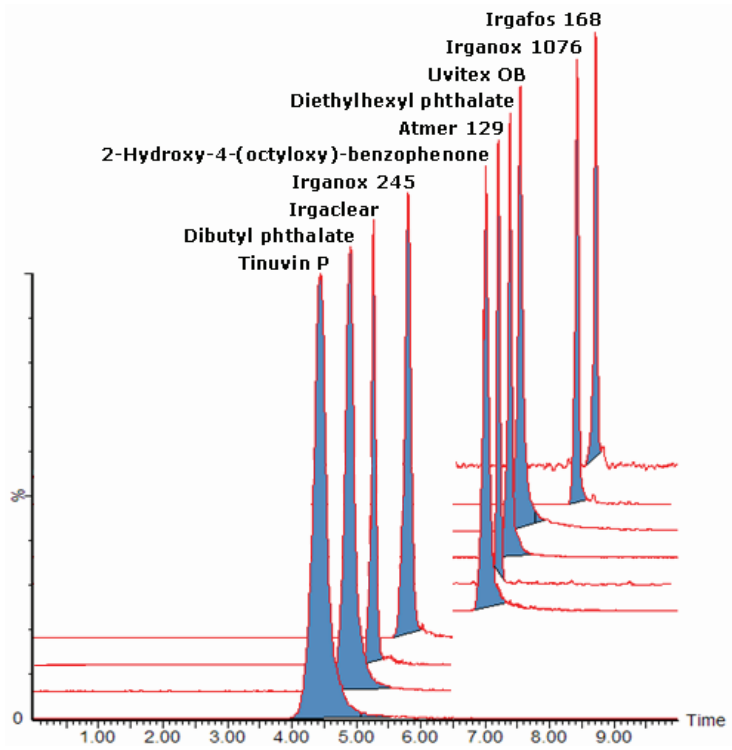

Figure 1. MRM chromatograms for 10 polymer additives acquired using Xevo TQD fitted with an APPI source, coupled to an ACQUITY UPLC System.

SUMMARY

Xevo TQD MS fitted with an APPI source, coupled to an ACQUITY UPLC System, were successfully used to analyze a diverse range of widely used polymer additives. The MRM data acquired were processed using TargetLynx Application Manager.

All the analytes of interest were readily ionized by APPI with acetone acting as the dopant. Good responses were observed for solutions with a concentration of 1 µg/mL (1 ppm), which suggest that the technique could be used to detect low levels of these types of compounds.

The source diversity offered with the Xevo TQD MS equips today's analytical laboratories with powerful tools to meet ongoing challenges.

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May 2011 720003975EN IH-PDF

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