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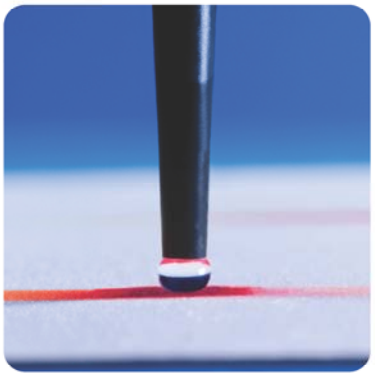
The TriVersa NanoMate is the latest in chip-based electrospray ionization technology from Advion. It combines the benefits of liquid chromatography, mass spectrometry, chip-based infusion, fraction collection, and direct surface analysis into one integrated system.

Application Note

Using the TriVersa Nanomate with LESA for Analyte Profiling in Material Science

Liquid Extraction Surface Analysis Mass Spectrometry (LESA/MS)

Surface analysis techniques have gained significant attention over the last couple of years with LESA[1] being an interesting alternative to techniques such as SIMS or MALDI imaging. LESA utilizes an organic solvent to extract compounds directly from the surface in a static extraction process, followed by nano-ES ionization and mass spectrometry analysis .



Initial studies showed its utility in the field of small molecule analysis from thin whole body cryo sections, MALDI targets, dried blood spots and food surfaces[1-5]. Recently, more technical surfaces were also successfully analyzed via LESA/MS[6]. More recently, LESA was also successfully applied in material sciences.

A team of researchers from the University of Wollongong, Australia used LESA/MS analysis to monitor the aging of polymer additives and found[6]:

'…Liquid extraction surface analysis mass spectrometry by means of a TriVersa NanoMate ionization source coupled to a QTRAP™ 5500 triple quadrupole mass spectrometer has proven to be a fast, simple and effective method in the detection of a hindered amine light stabilizer from a polymer-based surface coating. Like other ambient MS techniques, LESA-MS analysis can be performed with the sample remaining under standard atmospheric conditions; however, LESA-MS is unique in that no sample preparation or pre-treatment is required other than cutting the sample to a workable size.…'

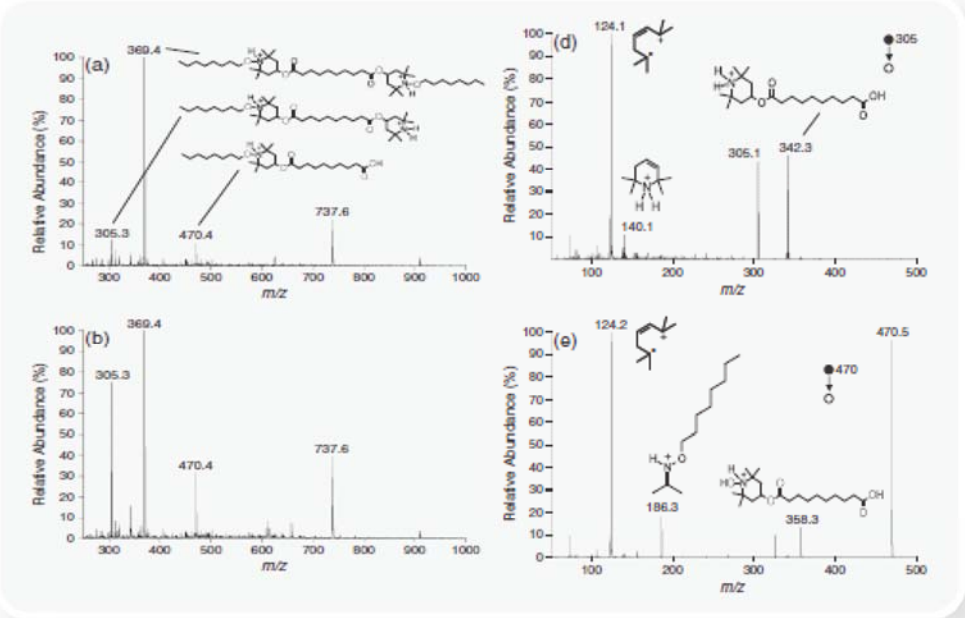


Figure 1: LESA/MS spectra acquired directly from cured polyester-based coil coatings containing TIN123: (a) no exposure to UV light or heat, (b) after 900h within a Q-Sun xenon test chamber (Q-Lab Corporation, Westlake Ohio, USA). Positive ion LESA/MS/MS spectra following CID of ions at (d) *m/z* 305.3, and (e) *m/z* 470.4 detected from a cured polyester-based coil coating [Paine et al. 2012].

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LESA analysis of contact lenses

Other surfaces of technical origin can be analyzed via LESA/MS as well. In this example a contact lens was probed utilizing different solvents. Using chloroform containing solvents actually dissolved the lens on the point of contact whereas other solvents only extracted analytes from the surface. Figure 2 shows information rich MS spectra in both positive and negative ion mode MS compared to the solvent only baseline.

- Liquid extraction surface analysis (LESA) of technical surfaces
- Rapid compound identification and profiling and spatial distribution analysis
- Polymer/additive analysis for medical devices or food packaging

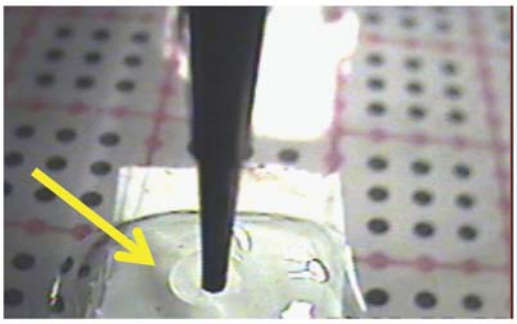

Figure 2: LESA extraction from a contact lens, yellow arrow shows the liquid junction formed on the surface.

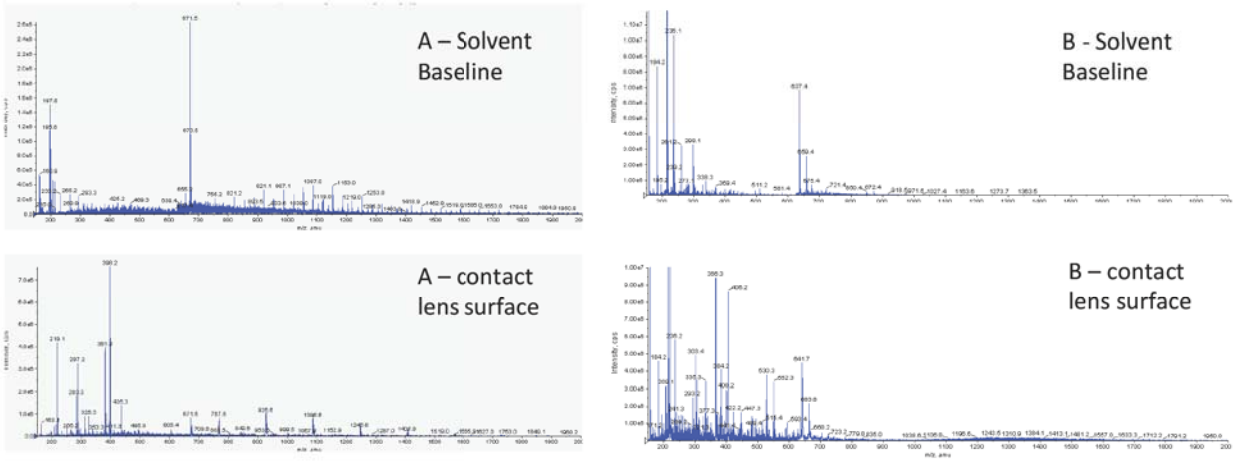

Figure 3: MS spectra obtained from the same contact lens using different solvent compositions for the extraction. A – using Chloroform/Methanol 1:1 with no modifier and negative ion mode MS; B – using 80/20 Methanol/Water 0.1 vol% formic acid and positive ion mode MS.

References

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[6]Paine MR, Barker PJ, Maclauglin SA, Mitchell TW, Blanksby SJ.: Direct detection of additives and degradation products from polymers by liquid extraction surface analysis employing chip-based nanospray mass spectrometry. Rapid Communication in Mass Spectrometry 2012; 26(4):412-418.