Analysis of aromatic amines in leather extracts by CE-MS

Application Note

Chemical Analysis

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Abstract

Leather must be treated before being used for the manufacture of leather goods, that is shoes, belts and jackets, so that it is durable. For this purpose a variety of chemicals and processes have been used over the years including treatment with aromatic amines. These amines can be toxic and their use is now prevented. However, some leather suppliers continue to use these amines despite their toxicity and this has to be monitored since skin contact with leather goods, which contain these compounds, can be hazardous.

CE with MS detection is ideally suited to providing specific identification of analytes in complex matrices which would present difficulties for HPLC. Organic extracts of leather fit this description exactly, therefore CE-MS is the analytical method of choice.

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Figure 1
EIC traces from amine standards.

Legend:
1. 4,4'-Diaminodiphenyl-methane (DDM)
2. Benzidine (BEN)
3. 4-methoxy-m-phenyldiamine (DAA)
4. 3,3'-dimethylbezidine (DMB)
5. o-toluidine (OTD)
6. 6-methoxy-m-toluidine (KRE)
7. 2,4,5-trimethylaniline (TMA)
8. Diphenylamine (ADP)
9. 4,4',-diamino, 3,3'-dichlordiphenylmethane(MCA)

Experimental

All experiments were performed using an Agilent CE system equipped with DAD detection and controlled by the Agilent CE ChemStation software.

The capillaries for CE-MS were 50 µm id with a total length of 70 cm. These capillaries have a UV detection window at 22 cm. The electrolyte was 1 % acetic acid. Sheath flow (4 µL/min) was delivered by an Agilent isocratic pump running at 400 µL/min and split 1:100 by a splitting device. Sheath liquid was 1 % acetic acid in 50 % methanol/water.

Leather samples were subjected to organic extraction and the extract injected directly into the CE capillary. Figure 1 shows the EIC traces from the CE-MS analysis of a standard solution of nine aromatic amines. The separation provides adequate resolution of all amines at the MS. Figure 2 shows the analysis of an extract of leather which had been treated with benzidine. Although in the UV trace there is a broad and unresolved hump associated with the benzidine peak, with MS detection the amine can be un-equivocally identified. CE-MS is the technique of choice for the analysis of these amines in a complex sample matrix.
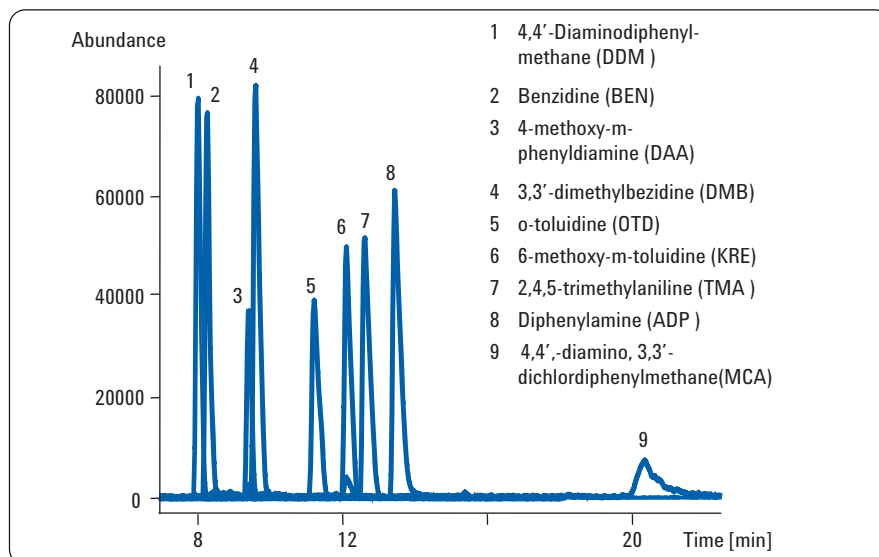
Chromatographic conditions

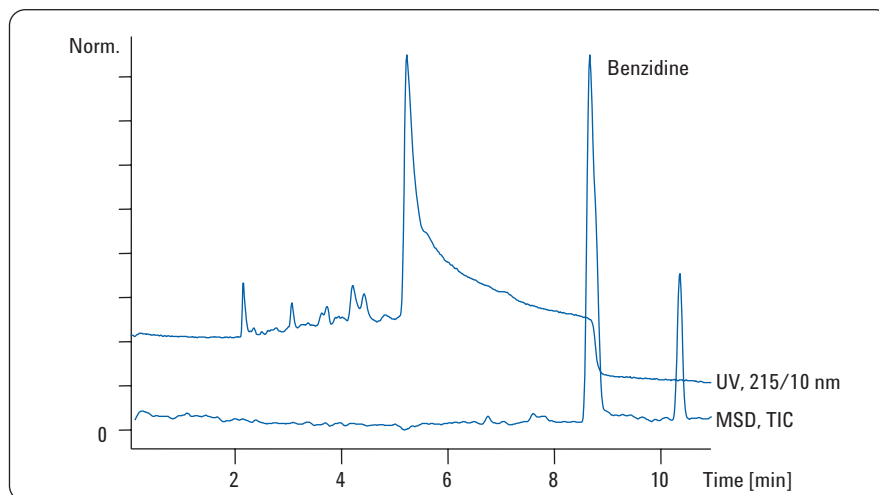|	
Voltage:	± 30 kV
Temperature:	20 °C
Detection:	215 nm
Injection:	4 seconds @ 50 mbar, API-ESI, Positive ion, full scan
	Fragmentor: 90 V, Dry gas flow: 7.0/minute, nitrogen
	Dry gas temperature: 180 °C, Nebulizer: 10 psi

Figure 2
UV and MS trace of leather extract.

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