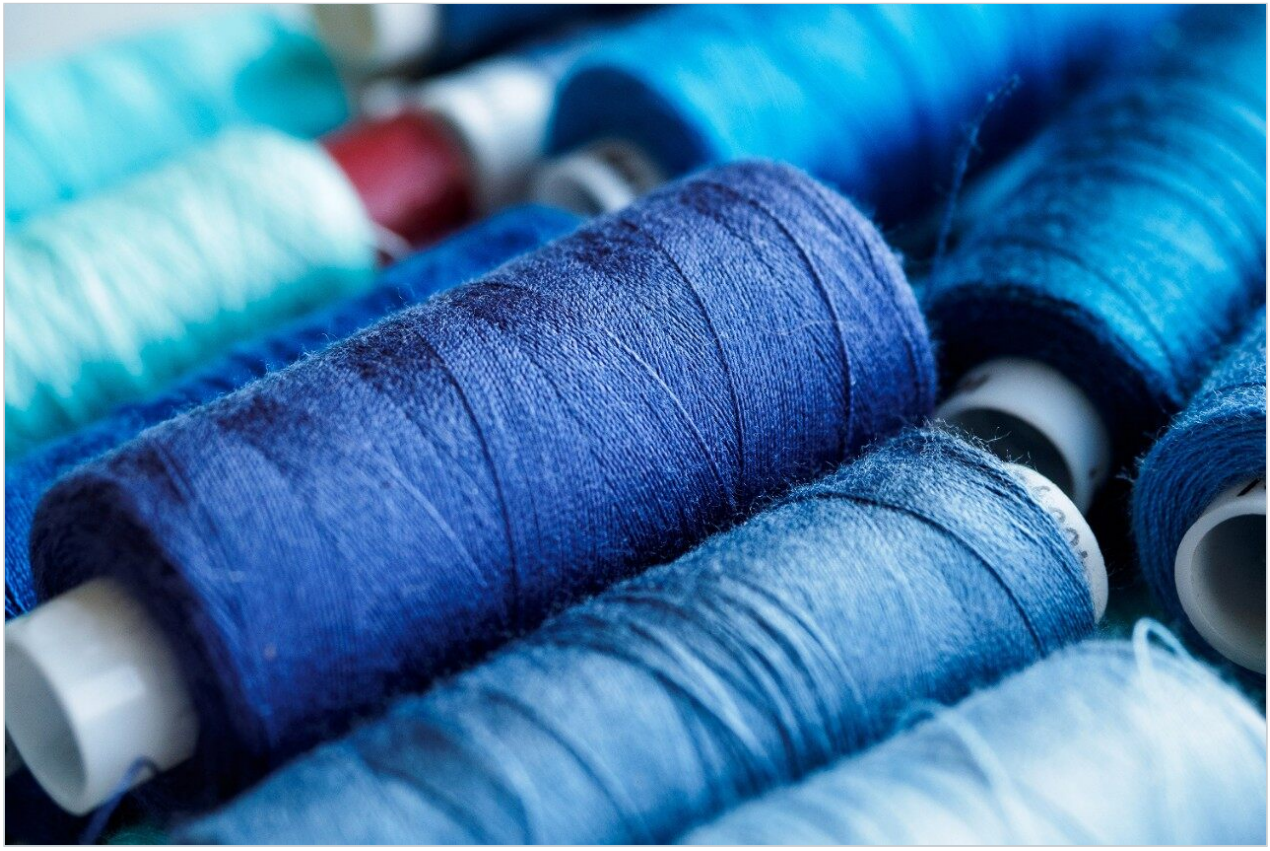
Waters™

□□□□

Rapid Analysis of Carcinogenic Aromatic Amines Using the ACQUITY UPLC H-Class SQD System with Empower 3 Software

Waters Corporation



This is an Application Brief and does not contain a detailed Experimental section.

Abstract

This application brief demonstrates to rapidly analyze 24 carcinogenic aromatic amines at legislated levels using Waters ACQUITY UPLC H-Class System, coupled with the ACQUITY SQ Detector, and Empower 3 Software.

Benefits

Screen samples for carcinogenic aromatic amines 7 times faster than conventional HPLC methods.

Introduction

Azo dyes are used in a wide variety of consumer goods, including leather, clothing, food, toys, medical devices, plastics, and cosmetics. There are more than 3,000 azo dyes that are available in a broad spectrum of colors, and these represent more than 65% of the global dye market.

Some azo dyes can degrade and release the carcinogenic aromatic amines listed in Table 1. The potential health risk of carcinogenic aromatic amine exposure to consumers has led to stricter government regulations worldwide. U.S. FDA regulations 21 CFR 74.705 and 21 CFR 74.706 restrict the use of azo food dyes that could degrade into carcinogenic aromatic amines. EU Directive (2002/72/EC) prohibits the use of food contact materials that release carcinogenic amines. EU Directive (2002/61/EC) bans the use of azo dyes in textile and leather articles, which, upon reduction, form carcinogenic aromatic amines.

Label	Compound Name	Cas No.	m/z	RT (min)
A	2,4-Diaminoanisole	615-05-4	139	1.2
B	2,4-Diaminotoluene	95-80-7	123	1.3
C	o-Anisidine	90-04-0	124	3.3
D	Benzidine	92-87-5	185	3.6
E	4,4'-Diaminobiphenylether	101-80-4	201	3.8
F	4-Chloroaniline	106-47-8	128	4.0
G	2-Amino-4-nitrololuene	99-55-8	153	4.3
H	2,6-Xylidine	87-62-7	122	4.8
I	p-Cresidine	120-71-8	138	4.8
J	4,4'-Diaminobiphenylmethane	101-77-9	199	5.0
K	2,4-Xylidine	95-68-1	122	5.0
L	o-Dianisidine	119-90-4	245	5.4
M	2-Naphthylamine	91-59-8	144	5.4
N	4,4'-Diaminobiphenylsulfide	139-65-1	217	5.4
O	Orthotolidine	119-93-7	213	5.4
P	4-Chloro-o-toluidine	95-69-2	142	5.7
Q	2,4,5-Trimethylaniline	137-17-7	136	6.4
R	4,4'- Diamino-3,3'-dimethylbiphenylmethane	838-88-0	227	7.0
S	4-Biphenylamine	92-67-1	170	7.2
T	3,3'-Dichlorobenzidine	91-94-1	253	7.5
U	4-Aminoazobenzene	60-09-3	198	7.6
V	4,4'- Diamino-3,3'-	101-14-4	267	7.7

, which typically requires 70 minutes for the separation of carcinogenic aromatic amines, this solution requires only 10 minutes, greatly increasing sample throughput. The ACQUITY UPLC H-Class/SQD System can be easily added to laboratories that already use Empower Software, circumventing the requirement of dedicated MS software. Empower users can thereby reap the benefits of MS without the need for additional training.

Conclusion

This work illustrates that the ACQUITY UPLC H-Class System, combined with ACQUITY SQD and Empower 3 Software enables rapid, selective, sensitive, and reproducible analysis of 24 carcinogenic aromatic amines. This 10-minute LC-MS method can be used to screen for the presence of carcinogenic aromatic amines in samples at the regulated limits. The ability to quickly and unambiguously screen samples for carcinogenic aromatic amines can facilitate quality control and regulatory compliance in textile and leather related industries. In addition, with a separation that is seven times faster than the conventional HPLC method, solvent consumption is reduced, and less hazardous waste is generated, resulting in cost and safety benefits. Other industries that have vested interests in the analysis of carcinogenic aromatic amines can also benefit from this methodology. Examples include the cosmetics, personal care products, food, and food packaging industries.

References

1. The European Standard EN 14362-1 and 2: 2003.

Featured Products

ACQUITY UPLC H-Class PLUS System <https://www.waters.com/10138533>

SQ Detector 2 <https://www.waters.com/134631584>

Empower 3 Chromatography Data Software <https://www.waters.com/10190669>

720003728, October 2010