SHIMADZU
Excellence in Science

PO-CON1417E

Rapid determination of ten colorants in lipstick samples by ultra high performance liquid chromatography coupled with triple quadrupole mass spectrometry utilizing transitions from double-charged precursor ions

Pittcon 2014 580-3P

Qisheng Zhong*, Xiongxiong Qiu, Caiyong Lin, Lingling Sen, Yin Huo, Song Zhan, Taohong Huang, Shin-ichi Kawano, Yuki Hashi,
Shimadzu Global COE for Application & Technical Development, Guang Zhou, 510010, China

Rapid determination of ten colorants in lipstick samples by ultra high performance liquid chromatography coupled with triple quadrupole mass spectrometry utilizing transitions from double-charged precursor ions

Introduction

Color is often the first quality by which cosmetic products are judged. Because compounds used as color additives and their concentration limits are subject to regulations in different countries [1], there is a growing need for analytical control of colorants to ensure that banned additives are not present in cosmetic products and to determine those permitted by regulations [2].
In this paper, a rapid and sensitive ultra high performance liquid chromatography-tandem mass spectrometry (UHPLC-MS/MS) method utilizing transitions from double-charged precursor ions for measuring ten colorants in lipstick samples was developed.

Experimental

Compound informations and the compound-dependent mass spectrometric parameters

Table 1. MRM parameters

No.	compound	Molecular weight	Precursor ion	Product ion	Q_1Pre Bias (V)	CE (V)	Q_3 Pre Bias (V)
1	Solvent Green 7	524.39	227.90	187.95*	11.0	14.0	19.0
				228.00	11.0	5.0	23.0
2	Acid Red 27	604.47	267.90	228.20*	19.0	14.0	23.0
				268.00	19.0	6.0	29.0
3	Carmine	492.39	267.90	205.90*	19.0	12.0	20.0
				268.05	19.0	5.0	18.0
4	Food Yellow 3	452.37	202.90	206.00*	22.0	25.0	22.0
				203.00	22.0	8.0	13.0
5	Naphthol Yellow S	358.19	312.90	232.95*	22.0	21.0	24.0
				295.90	22.0	24.0	29.0
6	Allura Red AC	496.42	225.00	206.95*	16.0	14.0	21.0
				224.95	16.0	5.0	23.0
7	Ponceau SX	480.42	217.00	199.10*	15.0	17.0	20.0
				217.05	15.0	6.0	22.0
8	Acid Red 87	647.89	646.50	522.65*	32.0	30.0	36.0
				520.70	32.0	25.0	36.0
9	Orange I	350.32	326.70	247.05*	11.0	19.0	26.0
				171.10	11.0	20.0	30.0
10	Acid Orange 7	350.32	326.90	171.05*	16.0	26.0	30.0
				156.15	16.0	29.0	28.0

* For quantitive use.

Rapid determination of ten colorants in lipstick samples by ultra high performance liquid chromatography coupled with triple quadrupole mass spectrometry utilizing transitions from double-charged precursor ions

Analytical conditions

HPLC	
Mobile phase	: A=0.02 mol/L ammonium acetate aqueous solvent; B=Methanol
Flow rate	: 0.5mL/min
Column	: Shim-pack XR-ODS II 3.0 mm × 75 mm column (2.2 µm)
Oven temperature	: 40 °C
Injection Volume	: 10 µL

MS/MS	
Desolvation line temperature	: 250 °C
Heating block temperature	: 400 °C
Drying gas	: 15 L/min
Nebulizer gas	: 3.0 L/min
Dwell time	: 40 ms
Pause time	: 3 ms

Shimadzu LCMS-8040

Results

Table 2. Method evaluation and the real sample results

No.	Linear range (mg/L)	Correlation Coefficient	LOD (mg/L)	LOQ (mg/L)	RSD (%)*		Recovery** (%)	RSD*** (%)
					RT	area		
1	0.2-10.0	0.9986	0.0247	0.0987	0.65	2.55	97.3	4.1
2	0.2-10.0	0.9974	0.0424	0.1695	0.12	3.95	63.1	3.2
3	0.1-10.0	0.9983	0.0111	0.0444	0.36	2.88	89.5	2.9
4	0.2-5.0	0.9966	0.0464	0.1854	0.59	1.60	108.0	3.5
5	0.2-10.0	0.9948	0.0061	0.0243	0.83	3.02	117.2	4.2
6	0.2-10.0	0.9991	0.0292	0.1169	0.71	2.33	101.3	3.0
7	0.2-5.0	0.9960	0.0272	0.1089	0.56	3.91	88.5	2.9
8	0.2-10.0	0.9963	0.0206	0.0824	0.79	3.13	97.3	2.2
9	0.2-10.0	0.9960	0.0133	0.0533	0.44	2.02	81.2	1.8
10	0.1-10.0	0.9954	0.0088	0.0352	0.24	4.23	111.0	2.2

*Spiked concentration is 0.5 mg/kg ** Spiked concentration is 0.2 mg/kg; *** RSD for the calculated concentration

Rapid determination of ten colorants in lipstick samples by ultra high performance liquid chromatography coupled with triple quadrupole mass spectrometry utilizing transitions from double-charged precursor ions

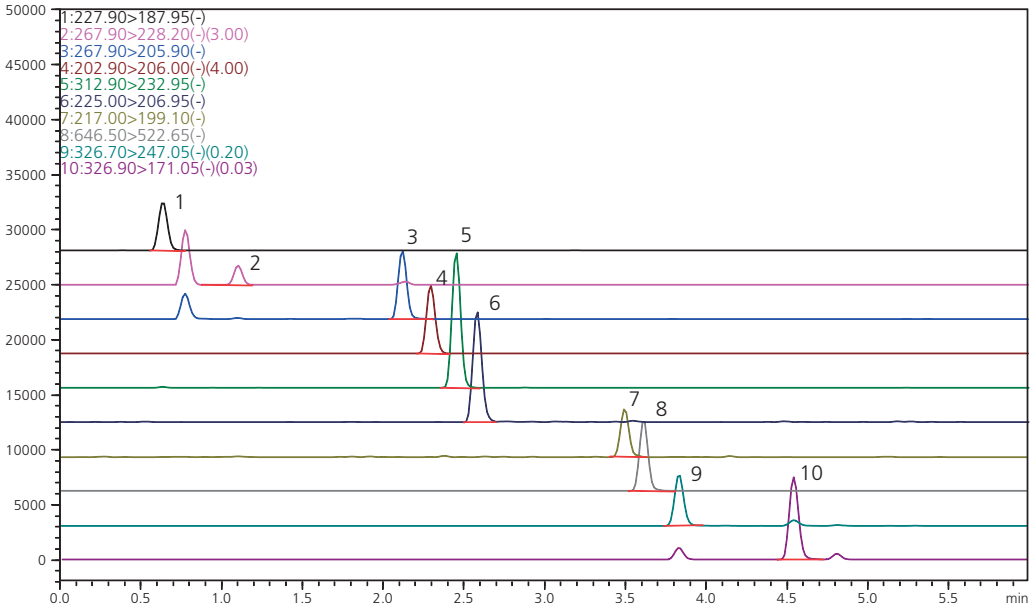

Figure 1. Chromatograms of lipstick samples spiked at 0.2 mg/kg.

Conclusion

A rapid and sensitive analysis method was developed for the determination of ten colorants in lipstick samples by using UHPLC-MS/MS device. According to the results, the proposed method is ideally suited for the routine monitoring and rapid screening of prohibited colorants in cosmetic products.

Reference

[1] González, M.; Gallego, M.; Valcárcel, M. Analytical chemistry. 2003, 75(3): 685-693.
[2] THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION. REGULATION (EC) No 1223/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 November 2009 on cosmetic products[S]. 2009.

First Edition: March, 2014

SHIMADZU
Shimadzu Corporation
www.shimadzu.com/an/