



High-Speed Analysis of Ultraviolet absorbing compounds in Sunscreen by Ultra High-performance Liquid Chromatography with Photodiode Array Detection

Introduction

In recent years, there has been increasing concern about cancer and skin damage caused by the sun's ultraviolet radiation. There is a growing trend to incorporate ultraviolet absorbing compounds in a variety of cosmetics and clothing as well as the more common use in sunscreens. However, these ultraviolet absorbing materials can cause skin allergies and their use is becoming more carefully regulated. Many of the UV absorbing compounds can be quickly analyzed and quantified using HPLC analysis.

In this report we will demonstrate a separation of a multi-component mixture of ultraviolet absorbing compounds using fast analysis by Ultra High-performance Liquid Chromatography (UHPLC) with PDA detection.

Keyword: UHPLC, Sunscreen , Ultraviolet absorbing compounds, C8 column, PDA detector, benzophenone



Jasco XLC system

Experimental

Equipment JASCO XLC 3000 UHPLC

Conditions

System Comprising

Pump:	X-LC 3185PU binary pump
Degasser:	X-LC 3080DG
Mixer:	X-LC 3180MX
Column Oven:	X-LC 3067CO
Autosampler:	X-LC 3159AS
Detector:	X-LC 3110MD

Column:	ZORBAX Eclipse Plus C8 (3.0 mmID x 50 mmL, 1.8 μm)
Eluent A:	0.2% Formic acid
Eluent B:	Acetonitrile
Gradient condition:	(A/B), 0 min(75/25) 3 min(35/65) 6.5 min(30/70) 6.55 min(5/95) 7 min(5/95) 7.05 min(75/25) 1 cycle; 9.5 min
Flow rate:	0.8 mL/min
Column temp.:	40°C
Wavelength:	200-650 nm
Injection volume:	1 μL
Standard sample:	12 ultraviolet absorbing compounds 0.042 mg/mL each in Acetonitrile

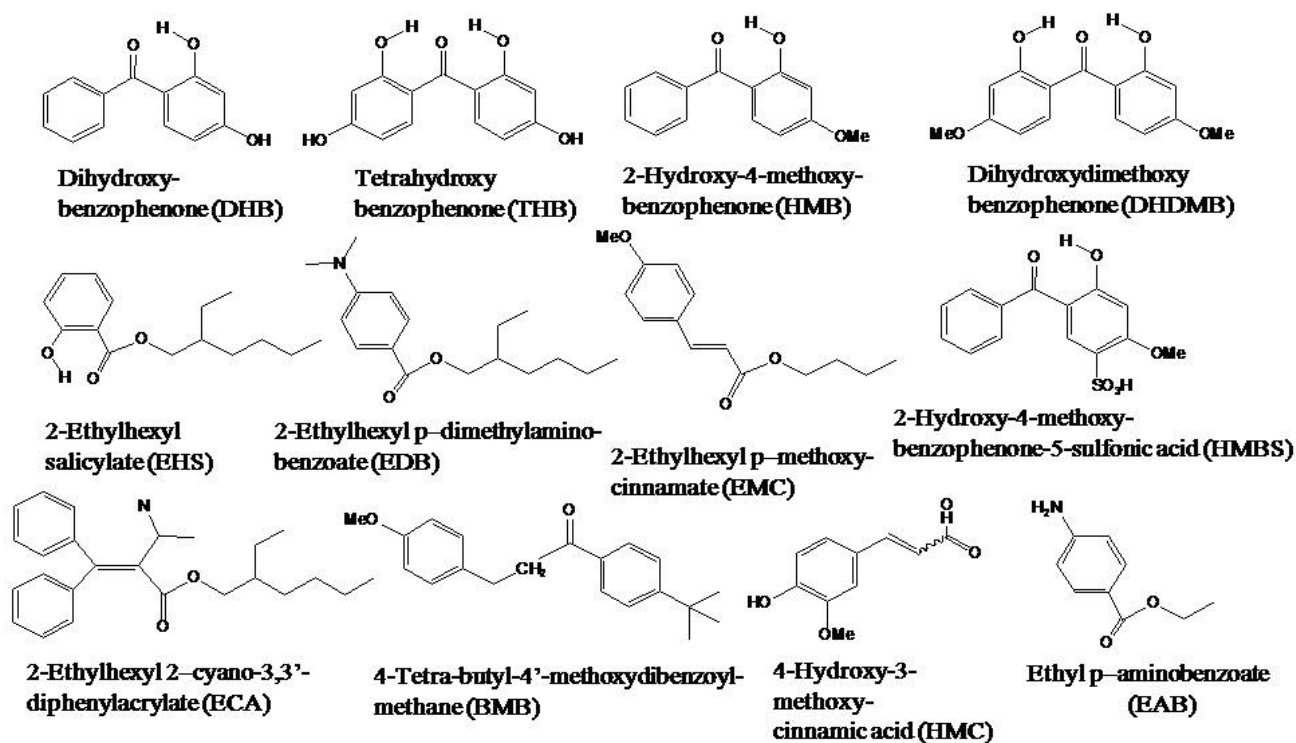


Fig. 1 shows the structures of 12 compounds used as Ultraviolet Absorbing compounds

Conditions

Fig. 2 chromatogram and contour plot of a standard mixture of UV absorbing compounds. Twelve components were clearly separated within 7 minutes.

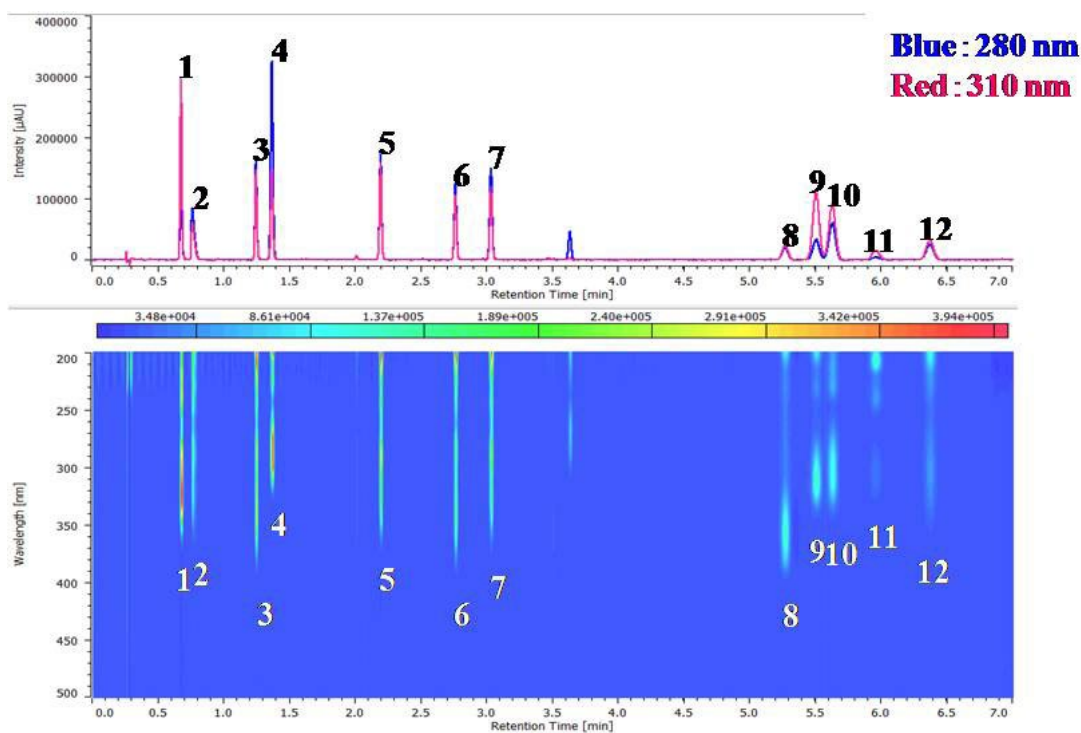


Fig. 2. Chromatogram of the standard mixture of UV absorbing compounds

1: HMC, 2: HMBS, 3: THB, 4: EAB, 5: DHB, 6: DHDMB, 7: HMB, 8: BMB, 9: EDB, 10: EMC, 11: EHS, 12: ECA

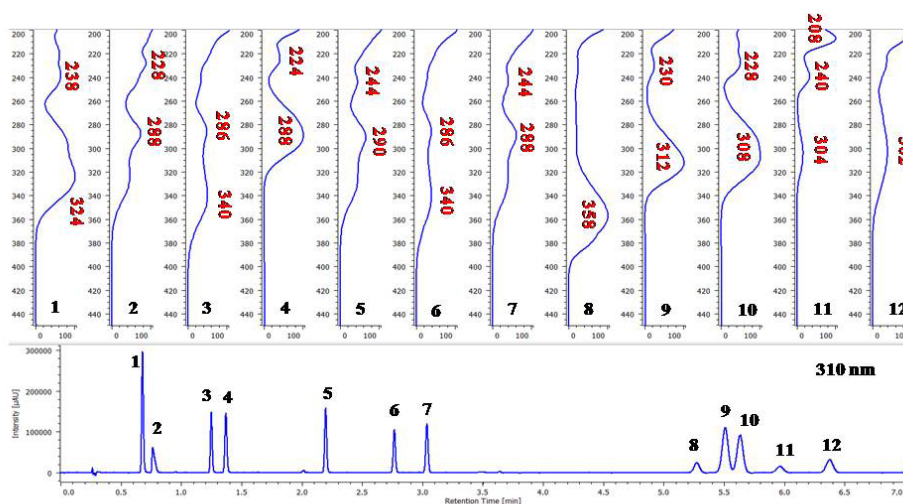


Fig. 3. On peak spectra of a standard mixture of UV absorbing compounds. The peak numbers and corresponding compounds are the same as in Fig. 2.

Fig. 4 UHPLC chromatogram of a commercial sunscreen. The principal component was eluted without any interference from other components contained in the sunscreen.

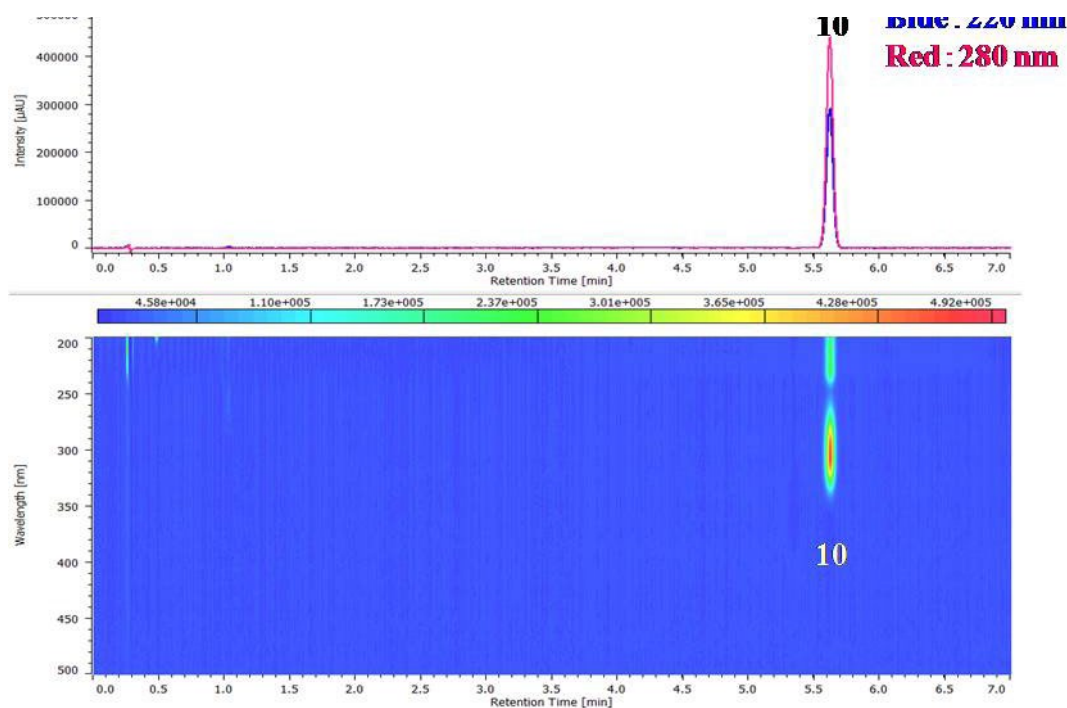


Fig. 4. Chromatogram of sunscreen. 10:EMC

Preparation of the sample

- 1) Weigh 0.4 g of the sunscreen
- 2) Dissolve in 4 mL of THF
- 3) Add 6mL of acetonitrile
- 4) Sonicate for 10 min
- 5) Add 10 mL of acetonitrile
- 6) Filter the supernatant liquid using a 0.45 μm filter followed by a 0.2 μm membrane filter
- 7) Dilute the filtrate 1 in 10 in acetonitrile