

Simultaneous Analysis of Phenoxyethanol and Parabens

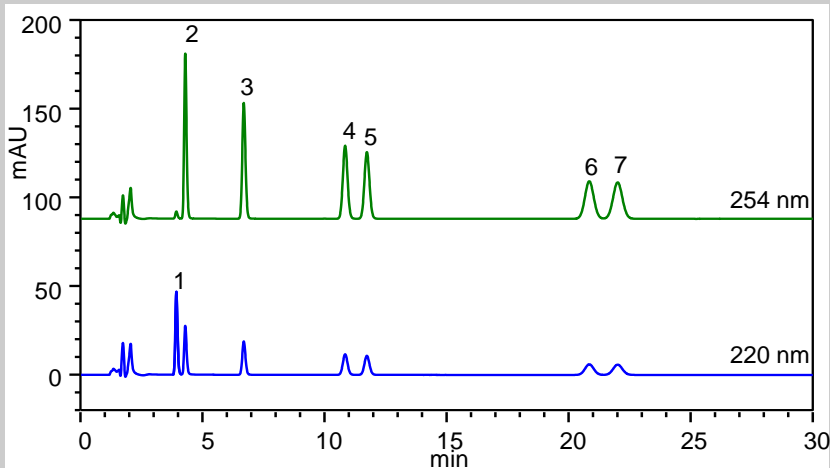
Paraben is a generic term for *p*-hydroxybenzoate esters. Due to their low toxicity in the human body, as well as antiseptic and mold proofing effects, parabens are used as preservatives in medicines, cosmetics, and foods. The Japanese Pharmacopoeia (sixteenth edition) lists 4 parabens: methyl *p*-hydroxybenzoate, ethyl *p*-hydroxybenzoate, propyl *p*-hydroxybenzoate, and butyl *p*-hydroxybenzoate. Phenoxyethanol is another component used as a germicide and antiseptic in cosmetics. It is a naturally-occurring compound that is found in substances such as green tea.

Phenoxyethanol is often used in combination with parabens in cosmetics to reduce the added paraben content. The Japanese Standards for Cosmetics (public notice of the Ministry of Health, Labour and Welfare) restricts the use of parabens and phenoxyethanol in cosmetics to 1 g each per 100 g of cosmetics.

In this presentation, we will introduce and examine the simultaneous analysis of phenoxyethanol and parabens.

Simultaneous analysis of phenoxyethanol and parabens

Measurement examples for standard samples

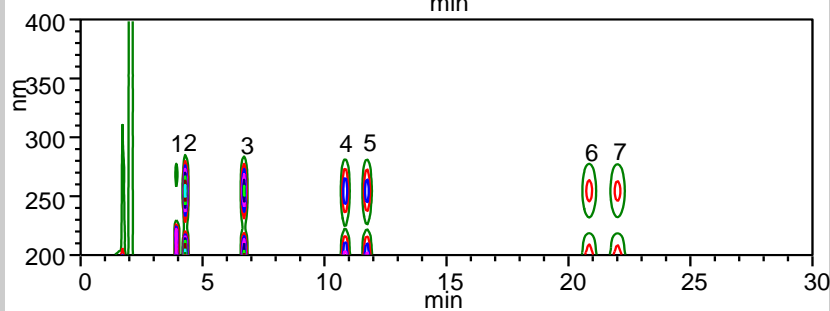


[Standard Samples]

- (1) 2-Phenoxyethanol
 - (2) Methyl *p*-hydroxybenzoate
 - (3) Ethyl *p*-hydroxybenzoate
 - (4) Isopropyl *p*-hydroxybenzoate
 - (5) Propyl *p*-hydroxybenzoate
 - (6) Isobutyl *p*-hydroxybenzoate
 - (7) Butyl *p*-hydroxybenzoate
- 10 mg/L each (prepared with methanol)

[Analytical conditions]

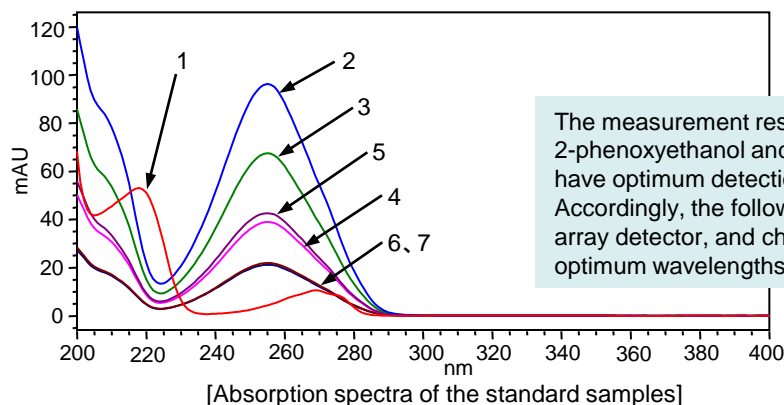
Elute: CH₃CN / 0.1 % H₃PO₄* (v/v) = 35/65 (v/v)
 Flow rate: 1.0 mL/min
 Injection rate: 10 μL
 Column: HITACHI LaChrom C18 (5 μm)
 (4.6 mm I.D. × 150 mm)
 Column temperature: 40 °C
 Detection: DAD 220, 254 nm
 (*: H₃PO₄ is of a special grade (85.0%))



[Contour indication and extraction chromatogram]

[Devices]

Chromaster
 5110 Pump
 5210 Automatic Sampler
 5310 Column Oven
 5430 Diode Array Detector
 Empower2 Data Processing System



[Absorption spectra of the standard samples]

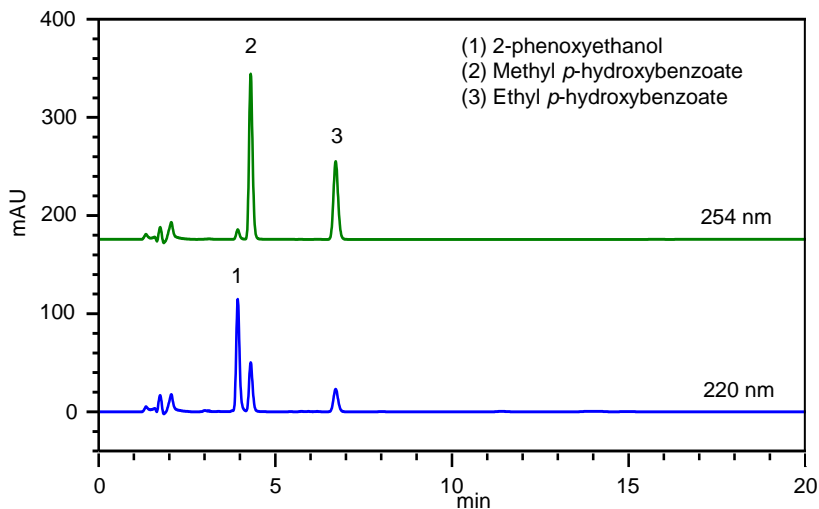
The measurement results from the diode array detector show that 2-phenoxyethanol and the parabens, respectively, have optimum detection wavelengths at 220 nm and 254 nm. Accordingly, the following samples were measured with the diode array detector, and chromatograms at these optimum wavelengths were obtained.

Linearity

Fair linearity was obtained for each sample, with $r^2 = 0.999$ or greater in the 0.1-50 mg/L concentration range.

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Example measurement of a real sample (1): Commercial face lotion

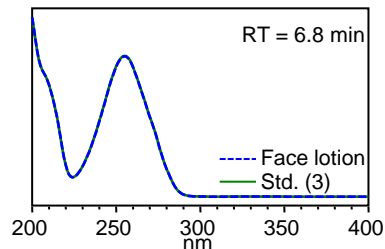
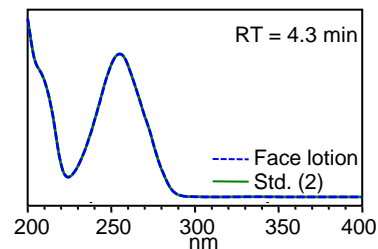
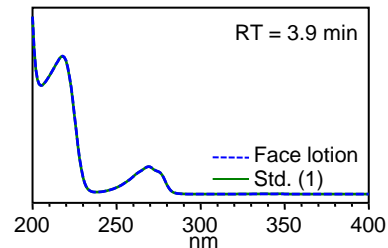


[Chromatograms obtained at optimum wavelengths]

[Sample pretreatment]

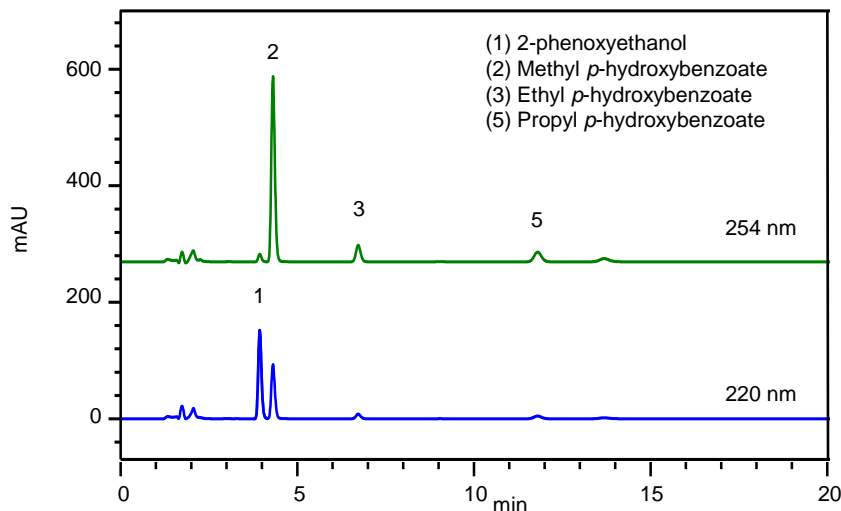
0.1 g of each sample was diluted to 10 mL with ethanol and filtered with a 0.2 μm filter.

Results: In this sample, (1) 2-phenoxyethanol, (2) Methyl *p*-hydroxybenzoate, and (3) Ethyl *p*-hydroxybenzoate were detected. In addition, each peak matches well with a corresponding peak of the standard sample. The analysis results show the usage of phenoxyethanol and parabens in this sample lotion as germicides and antiseptics in cosmetics.



[Peaks and spectra obtained for the standard sample]

Example measurement of a real sample (2): Commercial hand cream

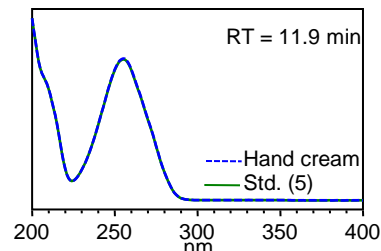
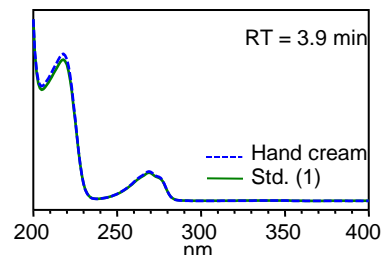


[Chromatograms obtained at optimum wavelengths]

[Sample pretreatment]

0.1 g of each sample was diluted to 10 mL with ethanol and filtered with a 0.2 μm filter.

Result: In this sample, (1) 2-phenoxyethanol, (2) Methyl *p*-hydroxybenzoate, (3) Ethyl *p*-hydroxybenzoate, and (5) Propyl *p*-hydroxybenzoate were detected. The results reveal the usage of phenoxyethanol and parabens in the sample hand cream as germicides and antiseptics.



[Peaks and spectra obtained for the standard sample]