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DESAGA Technology

Ready-to-use

Application Notes from the lab for the lab

Detection and Determination of Caffeine in Caffeine Shampoos by ProViDoc System DD70 and HPTLC-Densitometer CD60

Introduction

Caffeine-containing products have been consumed for hundreds of years for their pleasant flavor and stimulating effects on central nervous system. Hair care products containing caffeine targeted to stimulate hair growth and reduce hair loss [1].
High-Performance Thin-Layer Chromatography (HPTLC) is a useful analytical technique which requires low sample preparation. Different samples can be analyzed very fast and simultaneously under the same conditions.
Here qualification of the caffeine in caffeine shampoos from different suppliers was detected under UV light (254 nm) and the quantification was carried out by HPTLC-Densitometer CD60.

Keywords

HPTLC, Cosmetics, Shampoo, Caffeine, HPTLC-Applicator AS30, H-Separating Chamber, ProViDoc System DD70, HPTLC-Densitometer CD60

Sample and Standard Preparation

Four different caffeinated shampoo samples were examined. For each sample, the following steps were performed. 1 g shampoo samples were stirred with 10 mL isopropanol, centrifuged at 1000 rpm for 3 min and filtered. For preparation of the standard solution, 1 mg of caffeine standard was dissolved in 1 mL methanol.

Required Devices and Applied Parameters

Samples were applied onto pre-coated HPTLC plates by the HPTLC-Applicator AS30. Afterwards, the plates were developed in a solvent system inside the H-Separating Chamber. Then, documentation of the developed plate was performed under UV light by imaging system ProViDoc DD70. Finally, the determination of caffeine in samples was carried out by HPTLC-Densitometer CD60. Figure A shows the applied parameters and the used devices in this project.

Sample Application
HPTLC-Applicator AS30

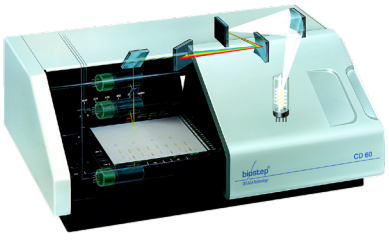
- Band length: 6 mm
- Track distance: 10 mm
- Application volume: 5 µL (sample), 4 - 8 µL (standard)
- Start position: 15 mm

Development
H-Separating Chamber

- HPTLC plates Nano-DURASIL-20 UV254 (Macherey-Nagel), 10 x 10 cm
- Developing solvent: 2-Propanol / n-Hexane / Water 7/3/1 (v/v/v)
- Saturation time: 20 min, 4 mL solvent
- Migration time: 1 h

Documentation
ProViDoc System DD70

- UV light at 254 nm



Quantification
HPTLC-Densitometer CD60

- Slit dimention: 4 x 0.1 mm
- Wavelength: 273 nm

Fig. A. Work flow for the identification and determination of caffeine in caffeine shampoos.

Results

Documentation

The caffeine was detected by ProViDoc DD70 under UV light (254 nm) at a *hRF* value of 43, see developed plate in figure B.

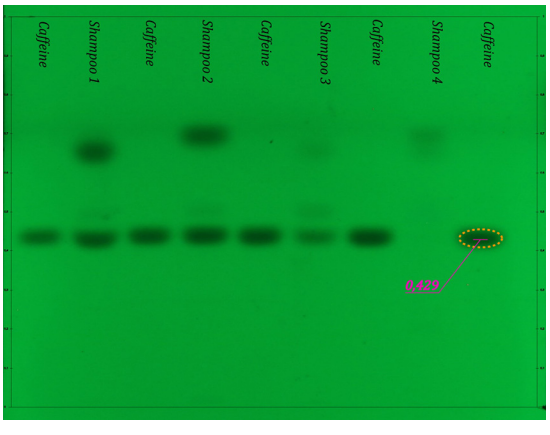


Fig. B. HPTLC plate under UV light (254 nm), tracks 1, 3, 5, 7 and 9: standards (4 - 8 µL); tracks 2, 4, 6 and 8: samples (5 µL each) from left to right.

Caffeine Calibration Curve

Quantification was carried out by biostep HPTLC-Densitometer CD60 and ProQuant software in absorption mode at 273 nm using a deuterium/tungsten lamp. The amount of caffeine in the samples was calculated by doing a 4-point-calibration (Figure C). The caffeine values were determined to be 0.91 mg/g for sample 1, and 1.18 mg/g for sample 2 (r = 0.9993). Slit dimension: 4 x 0.1 mm; evaluation via peak area.

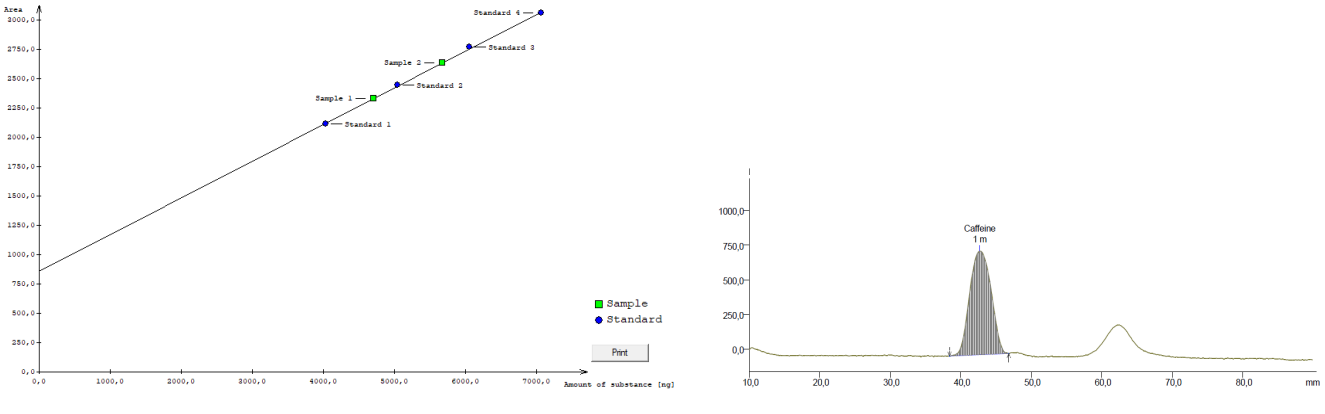


Fig. C. Left: Calibration curve of caffeine standard and samples, scanned at 273 nm, linear working range between 4000 and 7000 ng. Right: Absorption measurement of the sample 2, track 4.

Conclusion

These results show that caffeine can be easily detected and quantified by HPTLC analysis. HPTLC is a simple, fast and cost-effective technique as simultaneous analysis of standards and samples is possible on the same plates. Furthermore, in comparision to high performance liquid chromatography (HPLC), consumption of solvents per sample is very low and solvents do not need any prior treatment such as filtration and degassing.

Applied Devices and Material

Order No.	Description
BS130.500	HPTLC-Applicator AS30, 230 V, 10 µl dosing/ 25 µl filling syringe, incl. software
BS120.151	H-Separating Chamber 100 × 100 mm
BS140.061	ProViDoc System DD70, incl. CabUVIS 230 V, documentation top with UV filter, digital reflex camera, software
BS131.800	HPTLC-Densitometer CD60, 230 V, incl. interface, software ProQuant

All solvents used for this experiment were bought from Carl Roth GmbH, Karlsruhe, Germany.

Literature

[1] Fischer T. W, Hipler U. C, Elsner P., *Int. J. Dermatol.*, 2007, 46(1), 27.

Further information is available from the author on request.
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