



Contents lists available at ScienceDirect

Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy

journal homepage: www.journals.elsevier.com/spectrochimica-acta-part-a-molecular-and-biomolecular-spectroscopy



Molecularly-imprinted pumice as a selective solid-phase extraction adsorbent for kojic acid determination in cosmetic samples

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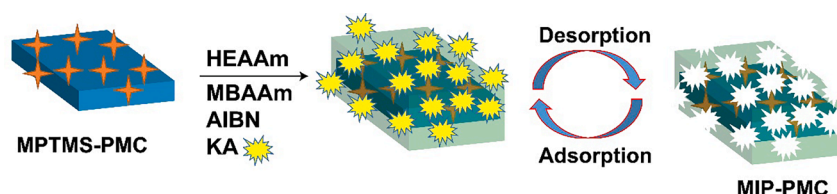
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HIGHLIGHTS

- A novel molecularly-imprinted pumice sample was fabricated for kojic acid.
- Kojic acid-imprinted pumice had high adsorption capacity and imprinting factor.
- A selective, sensitive, and rapid SPE/UV-vis method was successfully developed.
- The proposed method was effectively utilized for detection of KA in cosmetics.

GRAPHICAL ABSTRACT



ARTICLE INFO

Keywords:

Surface imprinting
Solid phase extraction
Kojic acid
Pumice
Cosmetic samples

ABSTRACT

Herein, a highly sensitive molecularly-imprinted pumice (MIP-PMC) was tailored by employed the surface imprinting method and utilized as a solid-phase extraction (SPE) adsorbent for the fast and selective separation of kojic acid (KA) from cosmetic samples. The MIP-PMC was characterized in a systematic manner and found it to be a well-grown polymer layer on the PMC. The adsorption capacity of MIP-PMC was 89.9 mg/g, with an equilibrium adsorption time of 30 min. Moreover, the imprinting factor of MIP-PMC towards KA was found to be 3.28, which further demonstrated its evident selectivity for KA. Under optimized conditions, KA was successfully isolated from cosmetic products using MIP-PMC and quantified via ultraviolet-visible (UV-vis) spectrophotometry. Method validation demonstrated excellent linearity within the range of 0.04–400 mg/L, satisfactory precision (less than 5 %), and high recoveries (98.0–100.4 %). Furthermore, the method exhibited a low limit of detection (LOD) of 12.8 µg/L with a preconcentration factor of 4. Moreover, the sensitivity of the developed method was also checked by using HPLC and the method has comparable analytical performance. The findings indicate that the integration of MIP-PMC based SPE with UV-vis spectrophotometry offers a highly efficient approach for sample pretreatment and the accurate determination of KA in real samples.

1. Introduction

Kojic acid (5-hydroxy-2-(hydroxymethyl)-4-pyrone, KA) is a well-known agent commonly used in the cosmetic industry for skin-lightening effects [1]. The ingredient is often used by consumers in

the form of KA and its derivatives to diminish the appearance of freckles and other hyperpigmentation locations. KA is also widely used in the food industry to maintain color and destroy particular bacteria through the transformation of tyrosine to dihydroxyphenylalanine in the melanin biosynthesis [2]. Nevertheless, the safety assessment of KA

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<https://doi.org/10.1016/j.saa.2025.126367>

Received 11 March 2025; Received in revised form 3 May 2025; Accepted 8 May 2025

Available online 10 May 2025

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JCR Year

2024

SPECTROCHIMICA
ACTA PART A-
MOLECULAR AND
BIOMOLECULAR
SPECTROSCOPY

ISSN

1386-1425

EISSN

1873-3557

JCR ABBREVIATION

SPECTROCHIM ACTA A

ISO ABBREVIATION

Spectroc. Acta Pt. A-Molec. Biomolec. Spectr.

Journal information

EDITION

Science Citation Index
Expanded (SCIE)

CATEGORY

SPECTROSCOPY

LANGUAGES

Multi-Language

REGION

NETHERLANDS

1ST ELECTRONIC JCR YEAR

1997

Publisher information

PUBLISHER

PERGAMON-
ELSEVIER
SCIENCE LTD

ADDRESS

THE
BOULEVARD,
LANGFORD
LANE,
KIDLINGTON,
OXFORD OX5
1GB, ENGLAND

PUBLICATION FREQUENCY

15 issues/year

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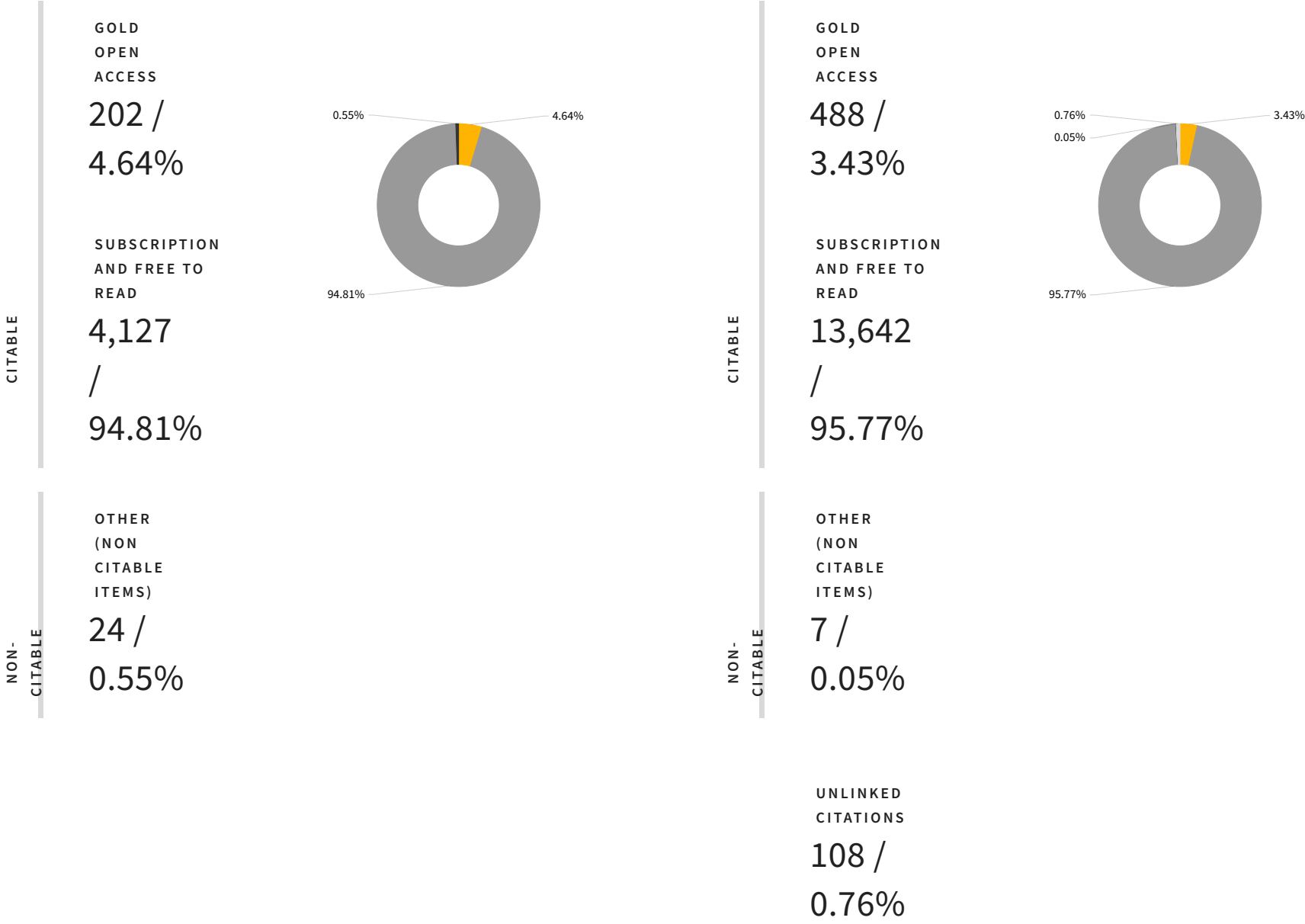
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