



Slovak Society of Chemical Engineering
Institute of Chemical and Environmental Engineering
Slovak University of Technology in Bratislava

PROCEEDINGS

51st International Conference of the Slovak Society of Chemical Engineering SSCHE 2025

Hotel DRUŽBA
Jasná, Demänovská Dolina, Slovakia
May 27 - 30, 2025

Editors: Assoc. Prof. Mário Mihal'

ISBN: 978-80-8208-158-2, EAN: 9788082081582

Published by the Faculty of Chemical and Food Technology Slovak Technical University in Bratislava in Slovak Chemistry Library for the Institute of Chemical and Environmental Engineering; Radlinského 9, 812 37 Bratislava, 2025

Mot, A., Covaci, E., Boşca, B., Dudu, A., Frentiu, T.: Green analytical strategies for selenium determination using chromatographic and spectrometric methods, Editors: Mihal', M., In *51st International Conference of the Slovak Society of Chemical Engineering SSCHE 2025*, Jasná, Demänovská Dolina, Slovakia, 2025.

Green analytical strategies for selenium determination using both chromatographic and spectrometric methods

Augustin C. Mot¹, Eniko Covaci¹, Bogdan Bosca¹, Adrian Dudu¹, Tiberiu Frentiu¹

¹*Department of Chemistry, Faculty of Chemistry and Chemical Engineering, Babes-Bolyai University, 11 Arany Janos Street, 400028 Cluj Napoca, Romania*

e-mail: augustin.mot@ubbcluj.ro

Key words: green analytical chemistry, selenium determination, oxygen flask combustion, chromatography, spectrometry, piaszelenol, fluorescence

Selenium is an essential trace element in animals and humans. Compared to other micronutrients, there is a much narrower range between the normal concentration and the toxic amount of selenium in living organisms. The inorganic forms of selenium (selenate, selenite) present up to 40 times higher toxicity than the organic species (*e.g.* selenocysteine, selenomethionine). Due to these considerations, a sensitive method is required for detection of selenium compounds in biological samples.

Development of greener, more sustainable, and ecofriendly methods for sample decomposition coupled with advanced miniaturised analytical techniques are future promising scientific activities for analytical chemistry. Although less explored recently, methods based on combustion with oxygen are excellent alternatives with potential great superiority over classical strong acids and oxidants-based sample digestion methods due to its high greenness degree, simplicity, speed, sample size and safety. Since the combustion takes place in a completely closed system, no analyte is lost, even the most volatile ones and the interference of organic matter is completely inexistent because the combustion takes place at very high temperatures.

In the present work, a simple and green version for oxygen rich combustion sample dissolution method using an oxygen flask prefilled with oxygen and a platinum-based catalyst is used for the decomposition of food type certified reference samples. Following this step, the samples are analysed using a small-sized electrothermal vaporization capacitively coupled microplasma optical emission spectrometry. For the validation of this method, other previously known methods—fluorescence spectrometry and high performance liquid chromatography—that have been employed as well.

Acknowledgements. This work was supported by a grant of the Romanian Ministry of Research, Innovation and Digitization, CNCS/CCCDI-UEFISCDI, contract nr. 15PED/2025, project number PN-IV-P7-7.1-PED-2024-0091, within PNCDI IV