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Author: J. Escobar-Arnanz, L. Ramos

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The latest trends in the miniaturized treatment of solid samples

J. Escobar-Arnanz, L. Ramos*

Department of Instrumental Analysis and Environmental Chemistry, Institute of Organic Chemistry, CSIC, Juan de la Cierva 3, 28006 Madrid, Spain

HIGHLIGHTS

- We review recent advances in miniaturized treatment of solid samples
- We identify and discuss the latest trends on the basis of a representative example
- We especially focus on the use of novel engineered, nano-sized materials
- We identify the most pressing remaining demands in the field

ABSTRACT

Miniaturization is a recognized trend in many analytical application areas, including the analysis of trace organic compounds in food and environmental samples. The many impressive advances achieved in recent decades in the analytical instrumentation used in this study area allowed a progressive reduction in the initial amount of sample used for analytical determinations without affecting the accuracy of the final result. This evidence promoted the development of a plethora of novel, miniaturized, analytical techniques for the treatment of liquid matrices. However, progress in the treatment of (semi-)solid matrices was much more limited, probably due to the greater complexity of the matrices and the persistent lack of appropriate small-scale instrumentation. Despite these shortcomings, research in this field remains active. This review covers recent advances and the latest trends in this research area.

Keywords:

Miniaturization
Nano-sized material
Representative sample
Sample preparation
Semi-solid matrix
Small-scale instrumentation
Solid matrix
Solid sample
Trace analysis
Trace organic compound

* Corresponding author. Tel.: +34 915622900; Fax: +34 915644853.

E-mail address: l.ramos@iqog.csic.es (L. Ramos)

1. Introduction

Greening the analytical process is a current demand in many application fields, especially those involving the treatment of relatively large amounts of samples through preparation protocols encompassing several independent treatment steps. The determination of minor compounds in complex matrices, such as foodstuffs and environmental samples, is

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