

Accepted Manuscript

Title: Nanoparticle-enhanced liquid-phase microextraction

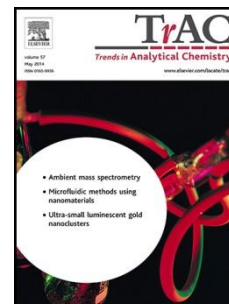
Author: Carlos Bendicho, Isabel Costas-Mora, Vanesa Romero, Isela Lavilla

PII: S0165-9936(15)00063-1

DOI: <http://dx.doi.org/doi:10.1016/j.trac.2015.02.007>

Reference: TRAC 14408

To appear in: *Trends in Analytical Chemistry*



Please cite this article as: Carlos Bendicho, Isabel Costas-Mora, Vanesa Romero, Isela Lavilla, Nanoparticle-enhanced liquid-phase microextraction, *Trends in Analytical Chemistry* (2015), <http://dx.doi.org/doi:10.1016/j.trac.2015.02.007>.

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Nanoparticle-enhanced liquid-phase microextraction

Carlos Bendicho *, Isabel Costas-Mora, Vanesa Romero, Isela Lavilla

Departamento de Química Analítica y Alimentaria, Área de Química Analítica, Facultad de Química, Universidad de Vigo, Campus As Lagoas-Marcosende s/n, 36310 Vigo, Spain

HIGHLIGHTS

- The role of nanomaterials in liquid-phase microextraction
- Carbon nanotubes used for reinforcing dispersive liquid-liquid microextraction
- Magnetic nanoparticles combined with hollow-fiber liquid-phase microextraction
- Affinity probes for matrix-assisted laser desorption/ionization mass spectrometry
- Fluorescent nanoparticles used as extraction probes and nanosensors in drop format

ABSTRACT

Nanostructured materials play roles in different areas of analytical chemistry. Implementation of nanomaterials in liquid-phase microextraction results in a synergic combination yielding enhanced performance. Some significant examples include: carbon nanotubes for improving extraction efficiency; magnetic nanoparticles for retrieval ionic liquids or organic solvents; metal nanoprobe in a solvent microvolume for desalting and ionization in the analysis of proteins and peptides by matrix-assisted laser desorption/ionization-mass spectrometry; *in situ* generation of noble-metal nanoprobe for extraction of hydride-forming elements prior to their determination by atomic spectrometry; confinement of fluorescent nanoprobe in a microvolume of organic solvent, thereby integrating separation, preconcentration and analyte recognition within a single step; and, solid-phase extraction involving nanomaterials and liquid-phase microextraction in a sequential way. We provide insight into significant advances involving the joint use of nanomaterials and liquid-phase microextraction.

Keywords:

Affinity
Carbon nanotube
Liquid-phase microextraction
Magnetic nanoparticle
Nanomaterials
Nanoparticle
Nanoprobe
Noble metal
Oxide nanoparticle
Quantum dot

Abbreviations: AAS, Atomic absorption spectrometry; APDC, Ammonium pyrrolidine-dithiocarbamate; CE, Capillary electrophoresis; CNT, Carbon nanotube; CPE, Cloud-point extraction; DI-SDME, Direct immersion-single drop microextraction; DLLME, Dispersive liquid-liquid microextraction; D-micro-SPE, Dispersive micro-solid phase extraction; DSDME, Directly suspended drop microextraction; EF, Enrichment factor; ETAAS, Electrothermal atomic absorption spectrometry; ETV-ICP-MS, Electrothermal vaporization-inductively-coupled plasma mass spectrometry; FAAS, Flame-atomic absorption spectrometry; GC-ECD, Gas chromatography-electron capture detector; GC-FID, Gas chromatography-flame ionization detector; GC-MS, Gas chromatography-mass spectrometry; HF, Hollow fiber; HPLC, high performance liquid chromatography; HS-SDME, Headspace-single-drop

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