

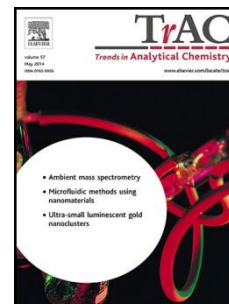
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Nano-scale surface analysis that combines scanning probe microscopy and mass spectrometry: a critical review

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Highlights

- Principles of combination systems of SPM and MS have been described.
- Applications of SPM-MS have been reviewed.
- Strengths and the limitations of SPM-MS have been discussed.
- Future development trends of SPM-MS have been predicted.

Abstract:

The simultaneous acquisition of morphological and chemical information simultaneously from solids surface with a nano-scale lateral resolution has become increasingly attractive for modern materials and biological research. Due to their respective advantages, combining scanning probe microscopy (SPM) and mass spectrometry (MS) with field evaporation, thermal desorption, and near-field enhancement is a perfect approach that satisfies the above-outlined research requirements.

This review covers the analytical trends of these combined techniques. Relevant research from recent years will be summarized, the principles of the representative techniques will be highlighted, applications will be briefly introduced, and potential problems will be discussed.

Keywords: Scanning probe microscopy; Laser-assisted ionization; Laser-induced near-field effect; Atom probe; Direct solid and surface analysis; Localized thermal analysis; Nano-scale lateral resolution; Mass spectrometry

1. Introduction

The direct analysis of solid at the nano-scale has become increasingly important for addressing the developments and challenges of nano-science and nano-technology. Many investigations need to obtain chemical information of solid samples with nano-scale lateral resolution. These studies

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