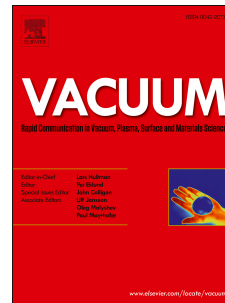


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A Review of the Development and Application of Space Miniature Mass Spectrometers

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Abstract: This article reviews the recent development and application of four types of space miniature mass spectrometers including magnetic sector mass spectrometer, quadrupole mass spectrometer, ion trap mass spectrometer and time-of-flight mass spectrometer. The advantages and the disadvantages of such mass spectrometers are briefly discussed. Finally, the expectations for improved properties and development trends of these mass spectrometers are presented.

Keywords: miniature mass spectrometers, space application.

1. Introduction

With the development of space science and technology, space exploration and manned space missions have become increasingly frequent [1-3]. The scientific objectives of these tasks are mainly focused on exploring biological and life matters, the origin of life and the evolution history of the planets, as well as searching for the planet's resources and space for human survival [4,5]. The realization of these objectives is closely related to the determination of their chemical composition, for which the commonly used methods include colorimetric tube, electrochemical sensor, pressure measurement, spectrometry and mass spectrometry. As a matter of fact, the colorimetric, pressure measurement and electrochemical sensor methods are usually used to monitor specific gases. For example, the colorimetric tube is used to monitor the CO₂ gas concentration at the space station [6,7]. Spectrometry is based on different chemical structure of the gas molecules which differ in wavelengths of light

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