ISSN- 2231–5667 (Print) www.asianpharmaonline.org
ISSN- 2231–5675 (Online)

REVIEW ARTICLE

Design and Potential of Mass Spectrometry

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ABSTRACT:
The mass spectrometry technique deals with a beam of electrons which produce an ionic molecule or ionic fragments of the original species. The resulting assortment of charged particle is then separated than according to their masses. The spectrum produced, known as mass spectrum is record information regarding various masses produced and their relative abundance. This article highlights potential approaches and theoretical aspects of mass spectrometry with its basic design.

KEYWORDS: Mass spectrometry, Ionized fragments, Mass analyzer, Gas chromatography, Ion mobility spectrometry.

INTRODUCTION:
Mass spectrum is an analytical technique which can provide information concerning the molecular structure of organic and inorganic compounds. It can be used to determine directly molecular weight as high as 4000. it is the one of few methods that can be used as a qualitative analytical tool to characterize different organic substances. With it, one can do analysis of mixtures (gases/liquids/solids) quantitatively. A mass spectrometer is also useful to investigate reaction mixtures and in traces work[1-3].

The term mass spectroscope continued to be used even though the direct illumination of a phosphor screen was replaced by indirect measurements with an oscilloscope. Mass spectroscopy is now abbreviated as mss-spec. Thompson has also noted that a mass spectroscope is similar to a mass spectrograph except that the beam of ions is directed onto a phosphor screen [4-5].

BASIC DESIGN AND OPERATION:[6-8]
The general operations of a mass spectrometer are
1. Create gas phase ions:
2. Separate the ions in space or time based on their mass to charge ratio;
3. Measure the quantity of ions of each mass to charge ratio;
4. The design of mass spectrometer has three essential modules:
5. An ion source, which transforms the molecules in a sample into ionized fragments;
6. A mass analyzer, which sorts the ions by their masses by applying electric and magnetic fields;
7. A detector, which measures the value of some indicator quantity and thus provides data for calculating the abundances of each ion fragment present.

POTENTIAL APPROACHES WITH DESIGN:
Fourier transforms mass spectrometry: it is a type of mass analyzer for determining the mass to charge ratio (m/z) of ions based on the electron frequency of the ions in a fixed magnetic field. It has very high accuracy and it help to determine the composition of molecules based on accurate mass[9].

Gas chromatography-mass spectrometry: Gc-ms is a method that combines the features of GLC and MS to identify different substance within a test sample. The applications include drug detection, fire investigation, environmental analysis, identification of unknown samples etc[10].

Ion mobility spectrometry- mass spectrometry: IMS-MS is a method that combines the features of ion mobility spectrometry and mass spectrometry to identify different substances within a test sample. It can be used in proteomies, for analyzing complex mixtures of peptides[11].

Ion trap mass spectrometry: the mass analyzer consists of a ring electrode separating two hemispherical electrodes. A

Received on 23.02.2011 Accepted on 28.02.2011

mass spectrum is obtained by changing the electrode voltages to eject the ions from the trap[12].

Isotope ratio mass spectrometry: it is used to measure the relative abundance of isotopes in a given sample. It allows the precise measurement of mixtures of stable isotops[13].

Liquid chromatography-mass spectrometry: lc-ms is an analytical chemistry technique that combines the physical separation capabilities of lc with the mass analysis of mass spectrometry[14].

Protein mass spectrometry: it is an important emerging method for the characterization of proteins. The two primary methods for ionization of whole proteins are electro spray ionization (ESI) and matrix-assisted laser desorption/ionization (MALDI)[15].

Tandem mass spectrometry: it involves multiple steps of mass spectrometry selection, with some form of fragmentation occurring in between the stages[16].

Time of flight mass spectrometry: a time of flight mass spectrometry uses the differences in transit time through a drift region to separate ions of different masses[16].

CONCLUSION:

Mass spectrometers use the difference in mass to charge ratio(m/e) of ionized atoms or molecules and also for determining chemical and structural information about molecules. Molecules have distinctive fragmentation patterns that provide structural information to identify structural components.

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