

Chromatography and Its Linked Technique in Traditional Chinese Medicine Research

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Abstract. Modernization of Chinese medicine is inseparable from modern, efficient separation and analysis techniques. The development of modern analytical techniques, especially the emergence of chromatography technology has accelerated the pace of traditional Chinese medicine research and development. The technology has required less sample, speed and other characteristics and get more information. At present, it is in a stage of rapid development and wide application of Chromatography techniques including gas chromatography-mass spectrometry (GC-MS), liquid chromatography-mass spectrometry (LC-MS), HPLC-NMR spectrometer combined with (HPLC-NMR), capillary electrophoresis-NMR spectrometer combined with (CE-NMR), liquid chromatography-mass spectrometry/mass spectrometry (LC-/MS/MS), liquid chromatography-NMR-mass spectrometry (LC-NMR-MS), capillary electrophoresis-mass spectrometry (CE-MS), etc. This paper conducts a preliminary exploration for chromatography-mass spectrometry prospect.

Introduction

Chromatography and hyphenated techniques and a variety of spectrum due to the diversity chromatography, mass spectrometry instruments, which contain a variety of methods and techniques associated with. Modern and efficient chromatographic mainly gas chromatography, high performance liquid chromatography and capillary electrophoresis technology-based, which means several chromatography with four large spectrum (MS, NMR, IR, UV) were combined with the natural composition of Chromatography rich content technologies. Since the chromatographic mobile phase, and these are mostly the mobile phase can not be accepted in spectral analysis, thus solving the problem of mobile phase naturally become associated with the first problem to be solved. But even so, due to the spectral sensitivity means is not very high, how chromatographic and spectral, MS is not very easy, four large spectrum and chromatography combined with showing a different pace [1]. Overall, due to the increasing requirements of analysis and various trace, preparative scale HPLC and spectroscopy, development of computer technology, combined with each averaging greater development. One of the most notable success was undoubtedly chromatography and mass spectrometry in conjunction with, such as gas chromatography-mass spectrometry (GCMs) and liquid chromatography-mass spectrometry (LC-MS). Multi-wavelength UV detector itself is by UV spectrum characteristic, and therefore with the development of technology, the photodiode, the photodiode array of the liquid color latent UV scanning detector has been replaced by a conventional multi-wavelength UV detector is commonly used instruments. Liquid Chromatography-scanning a photodiode array UV detector on the separated peaks can be obtained in which the UV spectrum of the mobile phase to be used for the qualitative analysis of the characteristics of some of the UV compound, and the selection of a suitable, sensitive UV absorption wavelength quantitative analysis. The unknown compounds can be used at every point of the value of the maximum absorption wavelength of the composition of the absorption sensitivity, chromatograms of unknown adaptive maximum absorption wavelength of the compound, as similar to the chromatography-mass spectrometry in the base peak chromatogram. With high-frequency, high sensitivity, fast development of superconducting NMR instrumentation, liquid chromatography and nuclear magnetic resonance combined with (LC-NMR) has gradually been developed. In

addition, gas chromatography and Fourier transform infrared spectroscopy (GC-FRIR), liquid chromatography combined with inductance curve plasma mass spectrometry (Lc-IcPMs), thin layer chromatography and mass spectrometry (TLC-MS) can also be combined with . Several series spectrum means the progress-further expanding the scope of Chromatography, its more successful examples include liquid chromatography-photodiode array UV scanning-MS (LC-PDA-MS), liquid chromatography-MRI-mass spectrum (LC-NMR-MS), and mass-mass of the liquid phase in combination with the color, such as LC-MS-MS (QqQ), LC-Ms, Le-Q-Tof like.

The Chromatography-mass Spectrometry Development and Application Examples

Chromatography and mass spectrometry coupled with the means currently the most attention. 80s GC has been very successful with mass spectrometry, and mass spectrometry with a 4-pole mini desktop development, mass spectrometry has become well have some qualitative features of GC workers detector, in some volatile components of traditional Chinese medicine Research has also been widely used. Application of high performance capillary gas chromatography to separate hundreds of components at the same time its mass spectrometry, coupled with the use of standard mass spectral library to match the identification and characterization is very normal thing. So far, the development of chromatography and mass spectrometry techniques mainly in liquid chromatography through a variety of connectivity interfaces associated with a variety of mass spectrometry to spend. This is because although capillary gas chromatography-mass spectrometry has a strong separation and characterization capabilities, but for drug research (such as traditional Chinese medicine extract) in most of the components, because of its non-volatile and need to be separated by liquid chromatography analysis, naturally require the use of liquid chromatography-mass spectrometry separation and qualitative research. To the liquid chromatography with mass spectrometry combined with a good problem to be solved between chromatography and mass spectrometry from two aspects, which include the removal of the liquid mobile phase liquid chromatography, mass spectrometry sensitivity, improving stability and mass volume, cost reduced. The most common method of removing liquid chromatography mobile phase is the removal of the volatile, but when the water content of the mobile phase high performance liquid chromatography, buffer salts and containing at higher flow rates, this is not an easy task. Therefore, the development of liquid chromatography and mass spectrometry interface has been one of its key technologies and impediments, until the early 1990s to develop a liquid chromatography and mass spectrometry combined with the atmospheric pressure interface (electrospray interface (ESI) and atmospheric pressure before the next chemical ionization interface (APCI), liquid chromatography coupled with mass spectrometry has become difficult [2].

Liquid chromatography and mass spectrometry in combination with the atmospheric pressure interface-electrospray ionization interface (ESI) and atmospheric pressure chemical ionization interface (APCI) is the use of gas-assisted (or high voltage) under the mobile phase is sprayed, the volatile solvent is removed, while the flow phase solute molecules at atmospheric pressure ionization. In this way a large extent solves the limitation on the use of LC-MS liquid chromatography mobile phase (such as limiting the flow rate of pure water), the sensitivity has also been greatly improved. And this is a soft ionization methods, mainly produce is "intended" molecular ion peaks. Further use of multi-stage mass spectrometry, can be very good for the structure of unknown compounds studied, which is to meet performance liquid chromatography-mass spectrometry soft ionization time requirements (such as the traditional way to approach to FAB-MS). The use of MS-MS selected clinical response measurement (SRM) are highly selective, and thus has good sensitivity and quantitative reliability. Around these ideas, different companies have carried out their own patented design to further improve the solvent interface, anti-pollution and increasing ion sampling rate and ion transport properties. Several typical interfaces include Finnigan's heated metal capillary interface PE firm anti inflatable curtain interface, Mieomass (Waters) Company type of spray interface and Bmker (Agilent) company orthogonal spray interface.

GC-MS Combined Applications of Traditional Chinese Medicine Research

The Applications of Traditional Chinese Medicine on Chemical Research. Analysis of volatile oil components: volatile oil because of its low boiling point, volatile characteristics particularly suitable for use GC-MS method for its analysis. Reported in the literature in this area more, such as Wu and other 10 kinds of different origin determination Xiaoyin fragrant herbs volatile oil components by Gc-Ms, the results show that this method is reliable, reproducible and suitable for determination of volatile oil. In addition, this method of Guangdong Ding and other volatile oil producing Guizhi component analysis, medicine Guizhi for GAP production base in Guangdong to provide a scientific basis. Meanwhile, Zhou et Court, GC-MS with different chemical composition of volatile oil eligible for surgery were measured in order to understand the difference between different habitats eligible for surgery volatile components provide a theoretical basis for controlling the quality of volatile oil. Analysis of volatile oil components: volatile oil because of its low boiling point, volatile characteristics particularly suitable for use GC-MS method for its analysis. Reported in the literature in this area more, such as Wu and other 10 kinds of different origin determination Xiaoyin fragrant herbs volatile oil components by Gc-Ms, the results show that this method is reliable, reproducible and suitable for determination of volatile oil. In addition, this method of Guangdong Ding and other volatile oil producing Guizhi component analysis, medicine Guizhi for GAP production base in Guangdong to provide a scientific basis. Meanwhile, Zhou et Court, GC-MS with different chemical composition of volatile oil eligible for surgery were measured in order to understand the difference between different habitats eligible for surgery volatile components provide a theoretical basis for controlling the quality of volatile oil.

Determination of fatty acid composition: Markov and other closing GC-Ms spectrometry determination of *Spartina* grass slices of fatty acids were detected *Spartina* grass has 13 kinds of fatty acids, the results contribute to the *Spartina* depth study of grass. Meanwhile, Wang with GC-MS method for the determination of the content of perilla oil α -linolenic acid, which α -linolenic acid is applied to fat, lowering blood pressure and cancer and other biological functions provide a scientific basis. In addition, this method for Xiaoyin Young incense extract the fatty acid composition were measured, also made a good quantitative analysis. Description above two GC-MS spectrometry analysis for Chinese medicines is a relatively mature technology, which TCM chemistry research has a positive meaning [3].

The Application on Identification of Traditional Chinese Medicine. GC-MS spectrometry to identify the authenticity of the medicine, seek and expand drug sources are important. Down on the stone, etc. Figure camp Po with water calamus fingerprints were analyzed by Gc-Ms spectrometry, the results show less volatile oil content of both the same, thus proving confuse the use of the lack of scientific basis. In addition, there were the GC-MS method for the study of a specific component authentic ingredients, such as Hsueh et Court, this method of volatile odor components of genuine and non genuine *Angelica sinensis* were compared, results showed genuine and non-road the relative amounts of the same odor components to *Angelica sinensis* different, and there are many different ingredients, which shows emphasized the genuineness of TCM drug has its theoretical basis.

The Application on TCM Biopharmaceutics. GC-MS spectrometry with its high resolution, high sensitivity can be used for in vivo determination of trace amounts of drugs and metabolites. In recent years, it was the traditional Chinese method was successfully applied to detect blood levels and pharmacokinetics [4]. Down House as measured plasma concentration Chuan Shao noise with Gc-MS spectrometry, a method is a plasma sample was ether isopropyl alcohol (10: 1) extract, after silylation treatment, choose selective ion GC-MS method and secondary ion monitoring. The measurement results of the linear range of $2\text{-}60\text{ng} \cdot \text{mL}^{-1}$, the recovery rate was 52% (RSD) were less than 9.0%, indicating that this law Chuan Shao noise kinetics clinical pharmacokinetics provide accurate and reliable content analytical tools.

The Application of HPLC-MS spectrometry on Traditional Chinese Medicine research

The Application on Chinese Medicine Chemical Research. Combined with technology has been widely applied to various content measured active ingredients of traditional Chinese medicine. As Gibbs and other high performance liquid chromatography an electrospray ionization mass spectrometry (HPLC-ESIMS) electron bombardment mass spectrometry screening in the quiet body soap Lily II, the results show that online and offline EIMS HPLC-ESIMS Yao silver leaves of the ginkgo acid were measured, conclusions confirmed that this method can make four Ginkgo acid and impurity components to achieve complete separation, the average recovery was 97.3%, RSD was 1.6%, can be used for quality control and quantitative analysis of ginkgo acid ginkgo leaf production. In addition, Wang et al using HPLC/MS/MS determination of Aconitum combined with herbs and medicine in Aconitum alkaloids also achieved good quantitative results.

The Application on Identification of Traditional Chinese Medicine. HPLC-MS spectrometry has been widely used in the identification of Chinese herbal medicines, Xu et with HPLC-Uv-MS combined technique on yellow smear fingerprints of herbs were laid the foundation for the establishment of international unity yellow smear quality standards [5]. Meanwhile Romer, etc. with HPLC/ESI-MS method for rapid identification of the inner leaf of the ginkgo ginkgo ginkgo vinegar and vinegar A, B, C, J. Additionally, this hyphenated technique is also used to study medicine isomers, such as Liu et al used combined with HPLC-MS and NMR (NMR) technology, dihydrotestosterone artemisinin isomers have been isolated and studied conversion phenomenon isomers. This shows that the HPLC-MS combined with technology has played an important role in the identification of research areas medicine.

The Application on TCM Biopharmaceutics. Like with the GC-MS, HPLC-MS has also been successful research medicine plasma concentrations and pharmacokinetics for. As Wang et al measured using this technique content of rat urine yellow smear armor past, the method in line with the biological sample analysis requirements for the determination of the content of Astragalus A former vivo provides a new approach. Meanwhile, Duchenne and other measurement HPLC-MS tandem method in rat plasma Han Huang Quan Su, the method is sensitive, rapid, accurate, and rat plasma concentration of Chinese yellow Determination and clinical pharmacokinetic study of generation can be used. In addition, the Kuok by liquid chromatography-electrospray ionization mass spectrometry detection in body fluids strychnine, brucine and its metabolites, also made a good analysis of the results, this method is rapid, simple, especially for Toxicology testing and other relevant departments to use.

Conclusion

Chromatography techniques has a high sensitivity, selectivity and broad applicability for the analysis of the mixture. It can extract known constituents and metabolites of unknown structure qualitative analysis and mass spectrometry can be used to medicine quantitative analysis of components and biological samples, it can be widely used in traditional Chinese medicine research and provides an efficient and practical method of analysis for speeding up the search for lead compounds. We believe that with the popularity of Chromatography equipment, it will be widely used in traditional Chinese medicine research in the field, thus speeding up the modernization of traditional Chinese medicine research process.

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