

COMPARATIVE ANALYSIS OF TABLETS OF DIFFERENT SERIES AND REFERENCE DRUG ON THE GROUND OF THE SUBSTANCE ADEMETIONINE 1,4-BUTANDISULFONATE BY INFRARED SPECTROSCOPY

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Summary: physical and technological properties of medicinal powders are closely linked to one another and in a certain way may affect the processes of pressing and obtaining high-quality tablets. As substance ademetonine 1,4-butandisulfonate – is gyroscopic, the essential stage of creation of medicinal drug on its basis is selection of methods that allow to estimate qualities of received pills swiftly and effectively. It is shown the possibility of using infrared spectroscopy method for rapid assessment of moisture effects on the structure of ademetonine.

Key words: ademetonine 1,4-butandisulfonate, infrared spectroscopy, humidity environment, hygroscopic substance.

Introduction. Contemporary requirements for providing the medicinal drugs quality provide that quantitative and qualitative characteristics of physical and chemical properties of active and additive agents, components compatibility in pharmaceutical form, pharmacologic and technological parameters must be confirmed by experimental data [1]. During the process of either development or routine control the important thing is a selection of not only high-precision methods that provide the effective analyze but also allow to reduce the time of the research itself considerably. Particularly important it is during the work with highly-sensitive to the moisture substances.

Infrared analysis – is a universal physical method that is applied in the research of structural features of different organic and inorganic compounds. Its peculiarity is possibility to carry out the research without previous sample processing that is very important during the work with moisture-retentive chemicals. This method is based on the phenomenon of atoms electronic absorption in the infra-red band. Absorption is connected with molecular vibrations dispersion of infrared light. During the molecule is irradiated by infrared light only those quanta are absorbed frequency of which agree with frequency of valence, deformational and vibrational motion of the molecules [2,3].

The purpose of our work was carrying out of comparative analysis of the tablets on the basis of ademetonine 1,4-butandisulfonate of different series with original preparation «Heptral» (company Abbott, Italy).

During the process of researches it was necessary to fulfill further tasks:

To pick up optimum moisture of the environment whereby it is possible to get the pill that is the closest to original;

To determine possibility of identification of moisture-retentive substance ademetonine 1,4-butandisulfonate by method of infrared spectroscopy.

During the work laboratory prototype of the pills on the basis of ademetonine 1,4-butandisulfonate and comparative drug were used. As the active ingredient of medicinal product is moisture-retentive, regular monitoring of relative moisture and temperature is important on all the stages of production : from the weighing and bolting of the elements until pills are ready [5].

We studied: lot 20515 (pattern №1 that was got under the environmental humidity of 15%), lot 10314 (pattern №2, environmental humidity 20%), lot 10513 (pattern №3, environmental humidity 30%) and lot 11113 (pattern №4, environmental humidity 40%).

Received pills were being investigated with the help of absorption infrared spectroscopy (AIR spectroscopy) in the intermediate infrared band (4000-400 cm⁻¹).

During the researches apparatus Thermo Nicolet IS50 with ATR module. This module allows to measure infrared spectrums absorption of the substance without any sample preparation. The results were compared with the data that was got during the studying of comparative drug «Heptral» (Abbott SpA) [4].

Results and discussions

For researching the structure of ademetonine, infrared spectrum absorption of tablets core on the basis of ademetonine 1,4 butandisulfonate of four patterns was written down. All the spectrums that are given on the first picture demonstrate the same frequency positions and intensity absorption bands except for some corners that are arrowed.

The first corner 3500-3300 cm⁻¹ where are all the absorption peaks are connected with -OH vibrations.

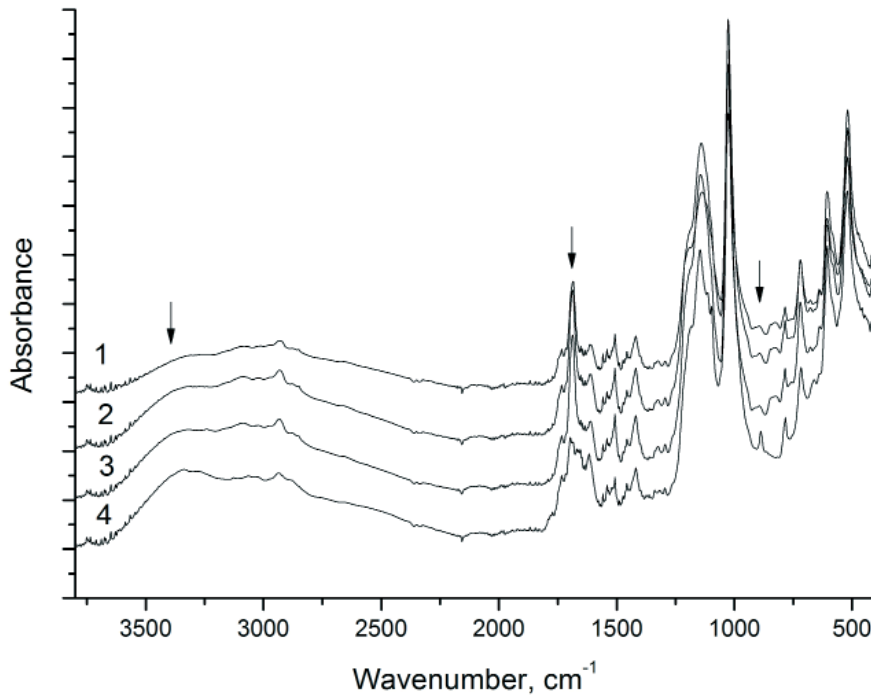


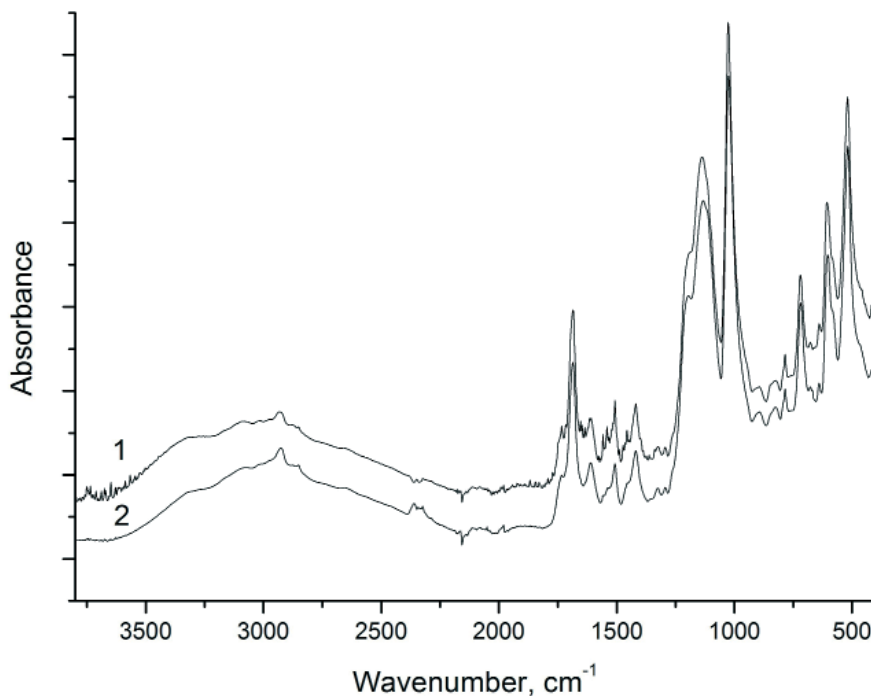
Figure №1. Infrared absorption spectra of patterns lot 20515, 10314, 10513, 11113

It's clear that the pattern № 1 has the smallest intensity of these lines while the pattern № 4 has the biggest. It correlates with the humidity level of the patterns. The other special feature is intensity decreasing of the absorption band with the centre 1697 cm^{-1} that is connected with fixed carbonyl compounds. If the level of humidity rises in the preparation arises the band 889 cm^{-1} that is connected with $=\text{C}-\text{H}$ cluster. On the ground of it, it's possible to make a con-

clusion that the pattern № 1 and the pattern № 2 are similar because of their structure.

For comparison, spectrum of the original tablet core and the pattern №1 were written down. The results are set out on the figure №2.

It's clear that the spectrum is identical. This way, in accordance with the results of our researches the mechanisms of transformation of ademetonine structure under the influence of water or $-\text{OH}$ groups. Received data con-



firm that optimized climatic conditions for the production of pills on the basis of the substance ademetonine 1,4 butandisulfonate is environmental humidity not higher than 20%, and the temperature 20 °C.

Conclusions. Comparative analysis of ademetonine 1,4 butandisulfonate pills of different series and reference listed drug «Heptral» was carried out with the help of infrared spectroscopy.

References

1. Исследование физико-химических взаимодействий в твердой фазе между компонентами препаратов анальгезирующего, противовоспалительного и жаропонижающего действия на основе парацетамола / Н. О. Ельцова, Г. Б. Голубицкий, Е. В. Будко, О. И. Изосимин // Международный журнал прикладных и фундаментальных исследований. – 2014. – № 3. – С. 118–123.
2. Identification of anisodamine tablets by Raman and near-infrared spectroscopy with chemometrics / L. Li, J. Li, H. Zang [et al.]. // Spectrochimica Acta Part A: Molecular Spectroscopy. – 2015. – № 127. – P. 91–97.

It is shown that infrared spectroscopy as operational method of the analysis allows to study the influence of the humidity on structural-informative qualities of the substance ademetonine 1,4 butandisulfonate in developing preparations.

It's experimentally determined and confirmed that optimized climatic parameters of getting pills, environmental humidity not higher than 20% and the temperature 20°C.

3. Chaveza P. Active content determination of pharmaceutical tablets using near infrared spectroscopy as Process Analytical Technology tool / P. Chaveza, P. Sacréa. // Talanta. – 2015. – № 144. – P. 1352–1359.
4. Frank S. Identification of a pharmaceutical tablet's origin using FT Near-IR and Principal Component Analysis / S. Frank, M. S. Weston // Agilent Technologies. – 2011. – P. 1–10.
5. Приборы для фармацевтического анализа // Фармацевтическая отрасль. – 2012. – № 4. – P. 104–106.

ПОРІВНЯЛЬНИЙ АНАЛІЗ ТАБЛЕТОК АДЕМЕТІОНІН 1,4-БУТАНДИСУЛЬФОНАТУ ТА РЕФЕРЕНТНОГО ПРЕПАРАТУ МЕТОДОМ ІНФРАЧЕРВОНОЇ СПЕКТРОСКОПІЇ

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Резюме: фізичні та технологічні властивості лікарських порошків тісно взаємопов'язані між собою і певним чином можуть впливати на процес пресування та одержання якісних таблеток. Оскільки субстанція адеметіонін 1,4-бутандисульфонату – гіроскопічна, важливим етапом розробки лікарського препарату на її основі є підбір методів, що дозволяють оперативно та ефективно оцінити властивості одержаних таблеток. Визначено можливість використання методу інфрачервоної спектроскопії для експрес-оцінки впливу вологості на структуру адеметіоніну.

Ключові слова: адеметіонін 1,4-бутандисульфонат, інфрачервона спектроскопія, вологість середовища, гіроскопічна субстанція.

СРАВНИТЕЛЬНЫЙ АНАЛИЗ ТАБЛЕТОК АДЕМЕТИОНИН 1,4 БУТАНДИСУЛЬФОНАТА И РЕФЕРЕНТНОГО ПРЕПАРАТА МЕТОДОМ ИНФРАКРАСНОЙ СПЕКТРОСКОПИИ

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Резюме: физические и технологические свойства лекарственных порошков тесно взаимосвязаны между собой и определенным образом могут влиять на процесс прессования и получения качественных таблеток. Поскольку субстанция адеметионин 1,4-бутандисульфоната – гигроскопическая, важным этапом разработки лекарственного препарата на ее основе является подбор методов, позволяющих оперативно и эффективно оценить свойства полученных таблеток. Показана возможность использования метода инфракрасной спектроскопии для экспресс-оценки влияния влажности на структуру адеметионина.

Ключевые слова: адеметионин 1,4-бутандисульфонат, инфракрасная спектроскопия, влажность среды, гигроскопическая субстанция.

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