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TUT DARAXTI POYASI VA ILDIZI ChIQINDILARI ASOSIDA OLINGAN KO‘MIR ADSORBENTLARINING IQ-SPEKTRLARINI O‘RGANISh

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ИК-СПЕКТРАЛЬНЫЙ АНАЛИЗ УГОЛЬНЫХ АДСОРБЕНТОВ, ПОЛУЧЕННЫХ ИЗ ОТХОДОВ СТВОЛА И КОРНЯ ТУТОВОГО ДЕРЕВА

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IR - SPECTRA ANALYSIS OF CARBON ADSORBENTS OBTAINED FROM MULBERRY STONE AND ROOT WASTE

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Tayanch so‘zlar: daraxt poyalari, ildizlari chiqindilari, uglerodli adsorbentlar, fizik faollantirish, termik faollantirish, IQ-spektroskopiya, infraqizil spektroskopiya, mikrog‘ovaklik struktura, funktsional guruhlar.

Rezyume. Maqolada tut daraxt poyalari va ildizlari ikkilamchi homashyosidan asosida olingan uglerodli adsorbentlarining IQ-spektrlari tahlil qilingan. Bu o‘simlik biomassasining fizik faollantirish usuli yordamida ko‘mir adsorbentlari tayyorlangan va ularning fizikaviy hamda kimyoviy xususiyatlari infraqizil spektroskopiya (FTIR) usulida tahlil qilingan. Olingan ko‘mir adsorbentlarining funktsional guruhlari o‘rganilgan. Olingan natijalar shuni ko‘rsatadiki, yuqori haroratda termik va suv bug‘i bilan faollantirilgan ko‘mir adsorbentlarining sirtida organik funktsional guruhlar miqdori kamayadi va mikrog‘ovaklik strukturani hosil qilish aniqlangan. Ko‘mir adsorbentlarining turli sanoat jarayonlarida, xususan, suv va havoni tozalash, sanoat chiqindilarini zararsizlantirish kabi sohalarda qo‘llanilishi uchun yangi imkoniyatlar yaratadi.

Ключевые слова: стволы деревьев, отходы корневой системы, углеродные адсорбенты, физическая активация, термическая активация, ИК-спектроскопия, инфракрасная спектроскопия, микропористая структура, функциональные группы.

Резюме. В статье анализируются ИК-спектры углеродных адсорбентов, полученных из вторичного сырья – стволов и корней тутового дерева. С помощью метода физической активации этой растительной биомассы были приготовлены угольные адсорбенты, и их физико-химические свойства были проанализированы методом инфракрасной спектроскопии (ИК-спектроскопии). Были изучены функциональные группы полученных угольных адсорбентов. Полученные результаты показывают, что количество органических функциональных групп на поверхности угольных адсорбентов, активированных термическим и водяным паром при высоких температурах, уменьшается, и обнаружено образование микропористой структуры. Это открывает новые возможности для использования угольных адсорбентов в различных промышленных процессах, в частности, в таких областях, как очистка воды и воздуха, а также утилизация промышленных отходов.

Key words: tree trunks, root waste, carbon adsorbents, physical activation, thermal activation, IR spectroscopy, infrared spectroscopy, microporous structure, functional groups.

Summary. This in the article mulberry tree stems and roots secondary from raw materials based on taken carbonaceous adsorbents IR spectra analysis This is done . plant biomass physicist activate method using coal adsorbents prepared and their physical and chemical features infrared spectroscopy (FTIR) method analysis done. Obtained coal adsorbents functional groups learned. Obtained results this shows that high at temperature thermal and water steam with activated coal adsorbents on the surface organic functional groups amount decreases and microporosity structure harvest to do Coal adsorbents different industry processes, especially water and the air cleaning, industry waste neutralization such as in the fields application for new opportunities creates.

Introduction. Tree stems and from the roots taken coal adsorbents ecological in terms of safe and cheap to be because of them water cleaning, air cleaning, industry waste neutralization and other different kind in processes application possible.

Tree stems and roots many organic and inorganic compounds own inside They will take. main part organic from compounds consists of, in particular chlorophyll, lignin, cellulose, hemicellulose and other from compounds consists of to be, their composition tree type, growth to the conditions and to others looking at change possible. Tree stems and from the roots taken coal, mainly high in quantity carbon saved materials is, their to oneself typical microporosity structure, chemical groups and electrostatic features with separated stands [1-4].

Tree stems and roots based on taken coal IR spectra of adsorbents of learning main essence of trees special morphological features and they based on removable coal adsorbents chemical and physical features analysis The IR spectrum (Infrared Quantum Spectrum) is mainly used to

measure the absorption of adsorbents. on the surface atomic and molecular structures, their functional groups in determining the material adsorbent features It is important to study. importance profession [3-6].

Plant biomass based on removable coals in the composition carboxyl, phenol, hydroxyl, amino, carbonyl groups and other different impact to the character has functional groups These groups are of coal chemical properties, especially adsorbent features In IR spectra, carbonaceous of the material microwave oven structure and heavy of atoms existence is also reflected The tree stems and from the roots taken of coals microporosity structures adsorbent density, relative surface surface the area and other physical features provides [7,8].

Literature analysis and methods. In the territories of our republic, especially in the Fergana Valley regions, farms make up the majority of the cultivated land. Mulberry trees are planted on the banks of these cultivated lands, the leaves of which are used as food for silkworms. During the season, the branches are cut and are currently used as fuel. In order to effectively use the secondary product, we set the goal of our scientific work to obtain an adsorbent from mulberry roots and branches.

Based on the above facts, mulberry tree stem and root waste was selected as the object of research. Adsorbents were prepared using the physical activation method of the selected tree stem and root waste. In the case of physical activation, coal adsorbents were obtained by thermally activating tree waste of a certain size at 400, 600, 800^{o}C for 1.5 hours in a pyrolysis device designed for laboratory conditions and activating it with water vapor at 800^{o} C. The obtained coal samples were named as follows: FT-activated mulberry tree roots and branches, a) samples obtained from mulberry tree stem waste were FT-1 (charcoal sample obtained at 400^{o} C), FT-2 (charcoal sample obtained at 600^{0}C), FT-3 (charcoal sample obtained at 800^{o}C); b) samples obtained from mulberry root waste FT-4 (charcoal sample obtained at 400 ^{o} C), FT-5 (charcoal sample obtained at 600^{o}C), FT-6 (charcoal sample obtained at 800 ^{o}C).

The quantitative and qualitative composition of functional groups in the obtained coal adsorbents was determined using the IR-spectroscopy (Shimadzu IRTracer100, Japan) method. The high sensitivity of the spectra (60000:1 signal/noise ratio) allows the analysis of the amount of impurities in various samples, despite the large non-intensities of the lines of interest in the spectrum. The spectral resolution of the IRTracer-100, equal to 0.25 cm $^{-1}$, ensures high accuracy for quantitative identification of the spectrum, especially in the case of gaseous compounds. The interferometer performance optimization system, combined with internal self-diagnosis, ensures stable operation of the device.

Results and discussions. The IR spectra of carbonaceous materials obtained from mulberry tree stem and root waste are presented in Figures 1 and 2. It can be seen that the peaks characteristic of various functional groups present in the organic components of the samples obtained from mulberry root waste are more than those of adsorbents obtained from tree stem waste biomass. Mobile hydrogens (CH) attached to carbons 1,3,5 of the aromatic ring are confirmed by intense peaks at 675-700 cm $^{-1}$. The carbonyl group is characterized by low intensity bending and stretching vibrations at 1550-1610 cm $^{-1}$. The absorption lines at 2300-2400 cm $^{-1}$ stand out among other peaks with relatively greater intensity.

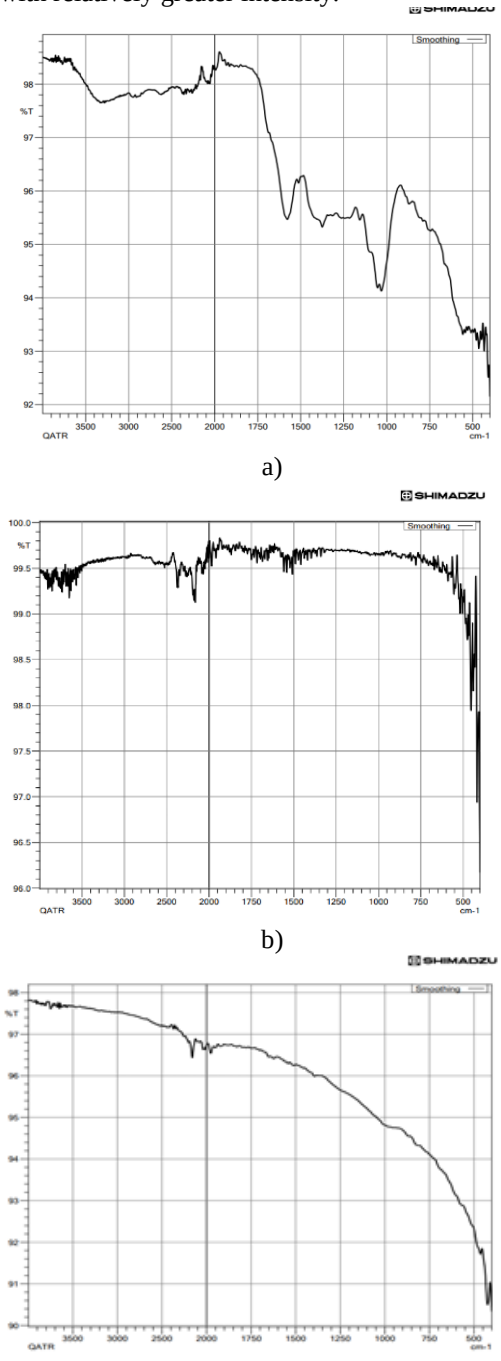
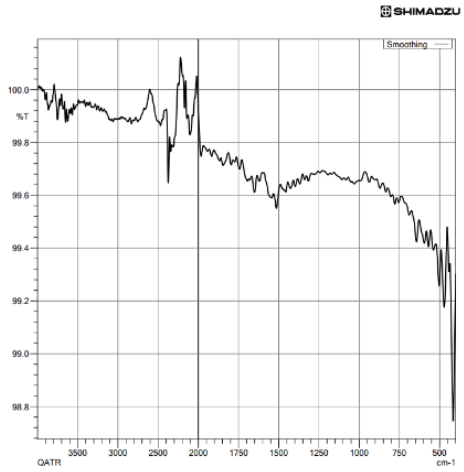


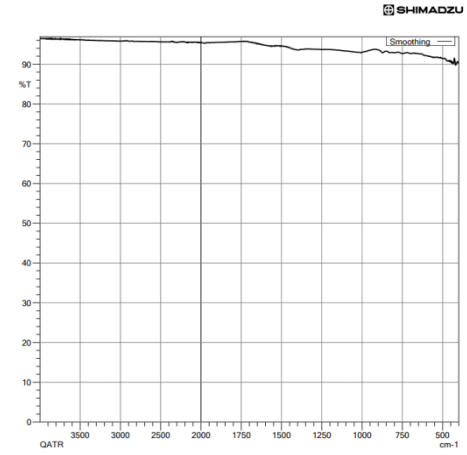
Figure 1. Mulberry tree horn based on taken coal IR spectra of adsorbents : *a) FT-1; b) FT-2; c) FT-3.*

650-750 cm $^{-1}$ indicate the presence of alkene and aromatic hydrocarbon rings (CH bonds). Obtained at 400 ^{o} C and 600 ^{o} C coal samples in the composition simple ether and amino groups (RO-, NH_2 -) are characterized by deformation vibrations in the range of 900-910 cm $^{-1}$. As a result of stretching vibrations in the absorption lines of 1000-1200 cm $^{-1}$, carboxyl and complex ester groups (COOH, $RCOOR_1$) appear.

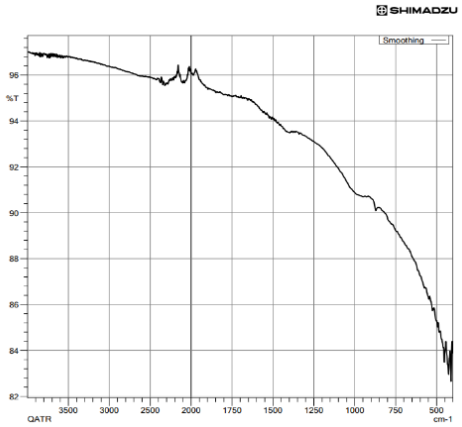
The 2000-2400 cm^{-1} absorption lines, which characterize the stretching vibrations of RN=C=S, Si-H and PH bonds, stand out among other peaks with relatively greater intensity. Hydroxyl groups are characterized by a peak in the region of 3500-3600 cm $^{-1}$.



a)



b)



c)

Figure 2. Mulberry tree root based on taken coal IR spectra of adsorbents: ***a) FT-4; b) FT-5; c) FT-6.***

at 800 ^{o} C is very low and that a microporous structure is formed in them.

Conclusion. The IR spectrum of coal adsorbents obtained from tree stems and roots is an important tool in studying their chemical composition and physical properties. Through this spectroscopic analysis, it is possible to determine the chemical groups, structure and adsorbent capacity of coal adsorbents obtained from mulberry roots and stems. The coal different features and his/her work mechanisms understand it further effective and ecological clean to the material to convert help This gives in the field take visited scientific research and analyses, coal working release and him/her industry in the processes in use new opportunities creates.

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