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Қ. И. Сәтпаев атындағы Қазақ ұлттық техникалық зерттеу университеті

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# ИЗВЕСТИЯ

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## ГЕОЛОГИЯ ЖӘНЕ ТЕХНИКАЛЫҚ ҒЫЛЫМДАР СЕРИЯСЫ

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## СЕРИЯ ГЕОЛОГИИ И ТЕХНИЧЕСКИХ НАУК

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# GEOLOGICAL AND MORPHOLOGICAL AND FLUORESCENT CHARACTERISTICS USED IN ASSESSMENT OF ALMATY CITY SOIL CONTAMINATION

**Abstract.** The article presents the data of geological and morphological, and spectral and optical characteristics of Almaty city soils to establish their differences from typical spectra of natural humic substances. The objects of research were soil samples and their water extracts from 5 patches of the Almaty city territory. The authors present the geological and morphological, and physics and chemical properties of soil samples, 4 of which are attributed to urban soils and 1 – to background soil taken 25 km from Almaty city for comparison. Shown, that the optical density of the absorbance and fluorescence spectrum of urban soils extracts was decrease upon increasing wavelength of the absorbed light. This is characteristic of humic substances. However, upon excitation by light with wave length 270 nm in the fluorescence spectra of the urban soils samples the additional peaks in the 330 ... 400 nm are revealed. This may be due to the presence of organic contaminants of anthropogenic origin: oil products, synthetic surface active substances or other organic contaminants. The different fluorescence spectra of the urban and background soil's samples have been calculated for greater certainty (for clarification). It was found that soil extracts from the background soil had fluorescence quantum efficiency values as typical for humic substances. These values were higher in 1.5-3 times for urban soil's samples which are connecting to organic contamination.

**Keywords:** geology and morphology of Almaty city soils, spectral fluorescence of soils, geoecology.

**Introduction.** Violation of many functions of the urban soils often connected to their contamination by various inorganic and organic pollutants.

The quantitative and qualitative compositions of organic contaminants presented in the aquatic ecosystems with sufficient accuracy are established by spectral methods [1] and method of georadiolocation in complex scientific applied researches [2].

Research objective is to study geological, morphological, spectral and optical characteristics of extracts of Almaty city soils to establish their differences from typical spectra of natural humic substances.

**Objects and methods of research.** The research objects were Almaty city soils, also their samples and extracts. The soil samples have been taken at 5 patches: four in the city (P. 1-4) and one from outside the city (P. 5) by the "envelope" method at a depth of 0-25 cm [3] for determination of geological and morphological and fluorescent characteristics.

The urban soil samples were collected along the Raimbek ave. crossing the city from east to west in an attitudinal direction. Samples from 3 patches (P.1 – Raimbek ave./Pushkin st., P.2 – Raimbek ave./Seifullin ave., P.3 – Raimbek ave./ Rozybakiev st.) selected near highways with heavy traffic, soil samples from 4 patch – near the TPP-1 (termal power plant). The control was the background soil (P.5), taken 25 km from the city.

The aqueous extracts from soil samples in the ratio 1:4 (soil: water) were prepared for assay and spectral measurements. The distilled water (200 ml) was poured to the pre-sieved (hole diameter 2 mm) of the soil sample (50 g). Obtained suspension was placed in a rotator and stirred at 120 rpm for 3 hours. After that, samples were filtered through "White Ribbon" paper filter. The density of upper organogenic horizons, porosity, total moisture capacity of soils, humus, $C_{tot.}$, $N_{tot.}$ were measured in the samples [4, 5].

All soil samples were cut back 10 times with distilled water for spectral measurements. Fluorescence emission spectra were registered in 1 nm interval on the fluorometer Solar CM2203 in standard quartz cuvettes at excitation wavelengths of 270, 310 and 355 nm. Electronic absorption spectra were measured on a double-beam spectrophotometer Unico in quartz cuvettes in 10 mm path length. Optical density values have been measured at an excitation wavelength of fluorescence by method of the reference compound. Calculation of the fluorescence quantum efficiency $F_{fl}$ was carried out by the method of the reference compound, applied for samples of natural water and commercial humic preparations earlier [1, 6, etc.]. An aqueous solution of quinine sulfate was used as a reference compound, because according to the shape of the spectral line and the position of the fluorescence maximum it's close to natural humic compounds [8, 1].

**Results and discussion.** Based on the soil cover patterns of our city (latitudinal direction in accordance with the general direction of geological structures and zones of major tectonic disturbances), 5 sampling patches for soil samples along Raiymbek ave. from east to west were chosen.

For soils of selected patches in Almaty city territory a lack of natural soil horizons was typical. A combination of different in color and thickness layers of artificial origin in the profile of soils was noted. The skeletal material is mainly represented by construction and household rubbish (fragments of rocks, broken bricks, glass, etc.) in combination with inclusions of fragments of natural soil horizons. Soils of the selected areas of urban soils are strongly over consolidated from the surface due to high recreational load and soil trampling, which made it difficult to grow small (active) roots of woody and herbaceous plants.

The soil cover of Almaty city is mainly represented by light chestnut soils.

Geological and morphological characteristics of patches

Geological conditions of P.1 patch: parent rock (soil-forming rocks) – proluvial-accumulative deposits (mudflow and river), higher loess deposits, positive form of relief. Geomorphology: the relief form is a slightly inclined accumulative foothill plain (about 720 m above sea level) of the northern exposure of Ile Alatau. Humidification is automorphic (rain).

Geological conditions of P.2 patch: parent rock (soil-forming rocks) – proluvial-accumulative deposits (mudflow and river), higher loess deposits, positive form of relief. Geomorphology: the relief form is a slightly inclined accumulative foothill plain (about 720 m above sea level) of the northern exposure of Ile Alatau. Humidification is automorphic (rain).

Geological conditions of P.3 patch: parent rock (soil-forming rocks) – proluvial-accumulative deposits (mudflow and river), higher loess deposits, positive form of relief. Geomorphology: the relief form is a slightly inclined accumulative foothill plain (about 720 m above sea level) of the northern exposure of Ile Alatau. Humidification is automorphic (rain).

Geological conditions of P.4 patch: parent rock (soil-forming rocks) – proluvial-accumulative deposits (mudflow and river), higher loess deposits, positive form of relief. Geomorphology: the relief form is a inclined surface of a hill in the foothill plain (about 730 m above sea level) of the northern exposure of Ile Alatau. Humidification is automorphic (rain).

Geological conditions of P.5 patch: parent rock (soil-forming rocks) – proluvial-accumulative deposits (mudflow and river), higher loess deposits, positive form of relief. Geomorphology: the relief form is weakly inclined accumulative foothill plain (about 720 m above sea level) of the northern exposure of Ile Alatau. Humidification is automorphic and hydromorphic (rain and underground).

We noted that the differences between the patches were of an ecological and anthropogenic nature.

A brief morphological description of the soil patches is presented in table 1.

Thus, Almaty city soils represented natural substrates with a bulk cultural layer, with a large number of construction and domestic inclusions in them. In the investigated urbansoas in all soil samples there was an upper crust of a layer of dust and mud, a denser composition, a horizontal structure of soils is weakly expressed. Zone soil differed from urban soils.

Table 1 – Geological and morphological characteristics of Almaty city soils

| Patch | Morphological characteristics |
|---|---|
| P.1 | 0-25 cm – artificial bulk soil, inclusions of anthropogenic character are few; 25 cm and below - a light chestnut loose layer |
| P.2 | 0-5 cm – thin crust of dust and dirt, structureless; 5-30 – light chestnut compacted soil, stony; urban soil |
| P.3 | 0-5 cm – crust of dust and dirt; 5-30 – light chestnut, dense layer, many inclusions of anthropogenic character, urban soil |
| P.4 | 0-5 cm – dry layer of dust and dirt (thin crust); 5-25 – light chestnut, compacted layer, little roots, stony, urban soil |
| P.5 | 0-5 cm – dense turf; 5-30 – light chestnut color, dense build-up due to a large number of roots, inclusions of anthropogenic character, no, referred to zonal background soils |

All data on physical and chemical parameters were averaged for the seasons of the year with a confidence level of $P<0.05$ and $P<0.01$. We determined that, according to morphological, physics and chemical properties they refer to black soil: the density of the upper organogenic horizons did not exceed 1.2±0.5 g/cm$^3$; porosity was 45.9±9.4%; total moisture capacity of soils was 35.7±7.2; humus was 22.9±4.4%; $S_{tot.}$ was 8.7±1.6%; $N_{tot.}$ was 0.48±0.09. Samples of background soil taken about 25 km from the city, according to geological, morphological, physics and chemical properties were classified as light chestnut soils, medium loamy soils. They had the soil addition density 1.2±0.6 g/cm$^3$, porosity 58.7±10.8%, total moisture capacity of soils 26.5±5.0, humus 18.9±3.4%, $C_{tot.}$ 2.8±0.5% and $N_{tot.}$ 0.33±0.06.

Thus, the research of the physical and chemical properties of Almaty city soils made it possible to identify their characteristic features: medium loams with a slightly alkaline and alkaline reaction of the soil medium with low differentiation of soil horizons with considerable dustiness. Dust contributed to the formation of a continuous crust on the soil surface through this the water permeability of the upper horizon was decreased. It led to a significant deterioration in the ecological state of green plantations: there was almost no grass and tree vegetation in P.3 and 4 patches. High density of urban soils reduced pore space and humidity level, which affected the vital activity of soil biota. Low humus content and elevated carbonates content indicated low stability of Almaty city soils to erosion.

The absorption and fluorescence spectra have been measured in soil samples extracts of Almaty urban soils and background soil in the Molecular Spectroscopy Laboratory of General Physics Department, Physics Faculty, M.V. Lomonosov Moscow State University.

The absorbance spectra of the research soil water extracts are shown in figure 1.

As it happens their optical density decreased monotonically with increasing a wavelength of the absorbed light. It showed about their similarity with natural humic substances which absorb light in the ultraviolet and short-wave visible spectral range. It is known that humic substances are macromolecules without periodic structure [8, 9]. Only a small part of them can be attributed to known classes of chemical compounds. The greater part is composed of organic molecules of various molecular weights, and "unclassifiable" chemical composition. Therefore, the absorption spectra of macromolecules' set with various compositions are structure-free. The particularity manifested as local maxima in the UV spectrum only in certain types of absorption spectra of aquatic humic substances (such as from the peat or lignosulphate) according to these investigations [1, 6]. Humic substances determine the spectral properties of the DOS (dissolved organic substance) of natural water. DOS in foreign scientific literature is often called "yellow substance" in English and "gelbstoff" in German. This reason is that the water with a high humic compounds concentration has yellow-brown color due to the absorption of ultraviolet and blue light.

The following figures show fluorescence spectra of aqueous soil extracts (P. 1-5 samples) upon excitation by light with a wavelength of 270, 310 and 355 nm. The narrow line in the short-wave part of the emission spectra is a line of light Raman scattering by water molecules. Their locations at 290, 340 and 405 nm wavelengths showed in figure 2 a, b, c respectively.

The maxima of difference spectra approximately corresponded the spectral range of luminescence of contaminants in soil samples from P. 1-4: 330, 375 (the most intense band), and 475 nm.

Table 1 shows the values of the quantum yield of the fluorescence and optical density.

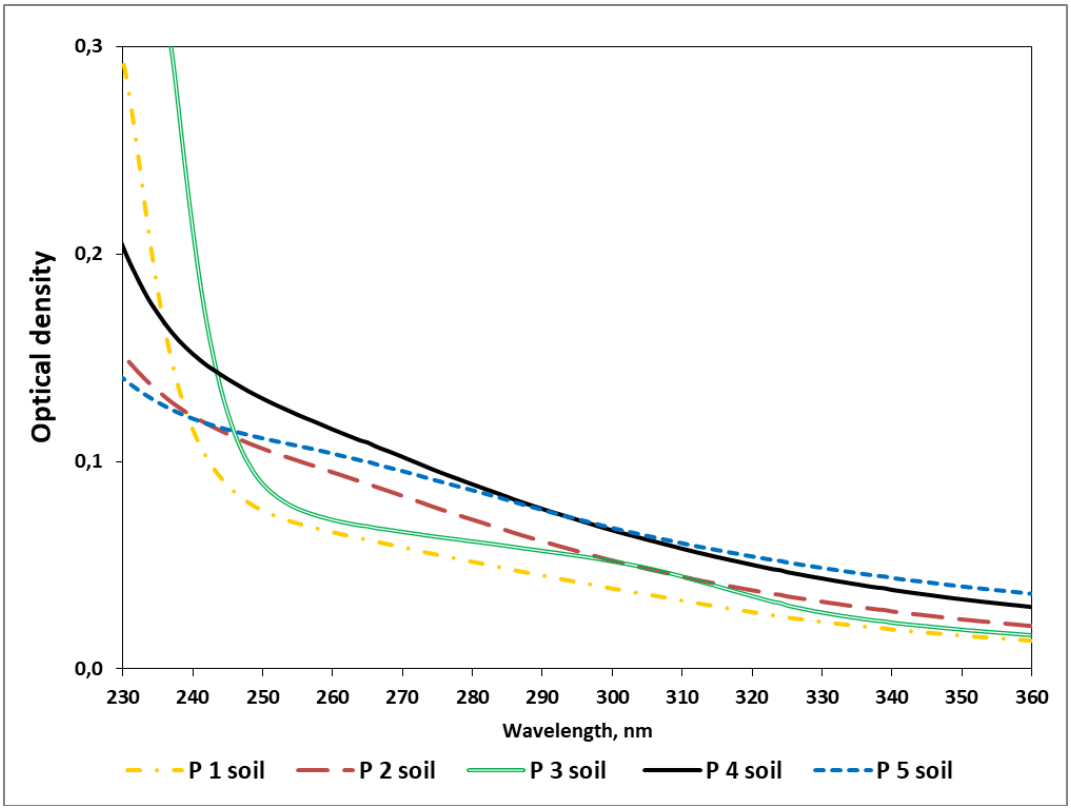
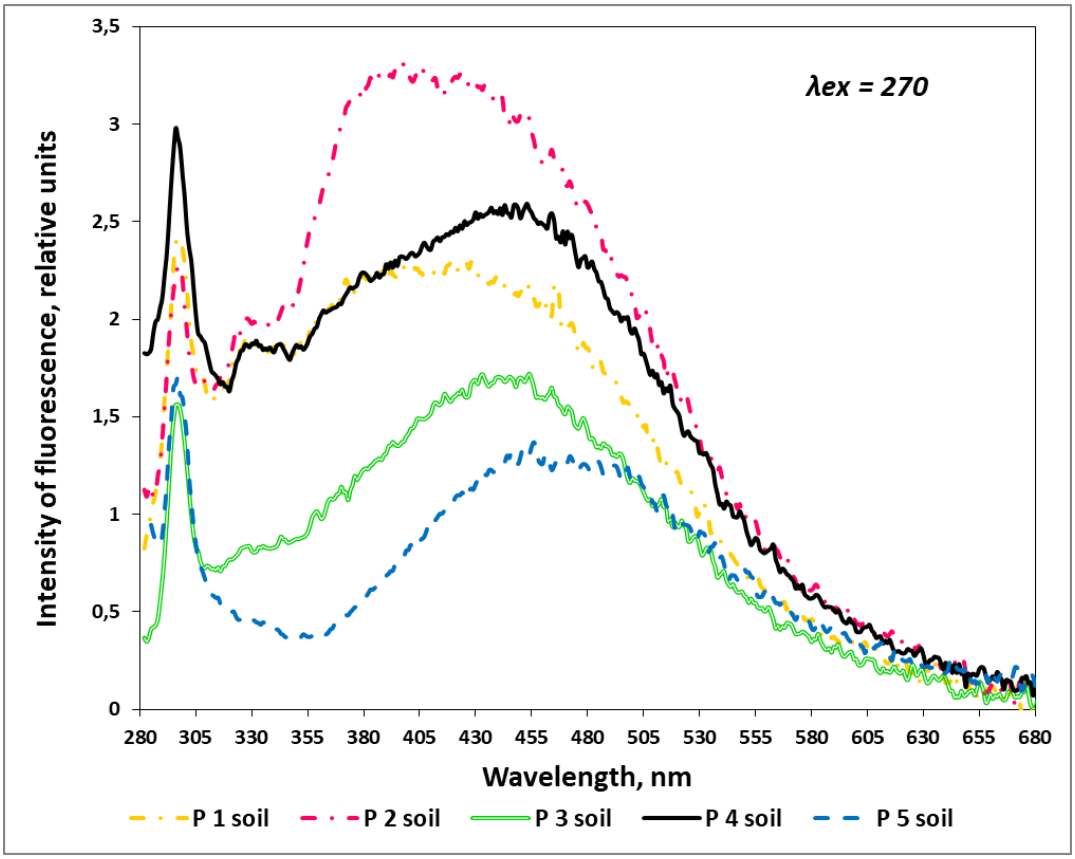



Figure 1 – Absorbance spectra of soil extracts (P. 1-5 samples)

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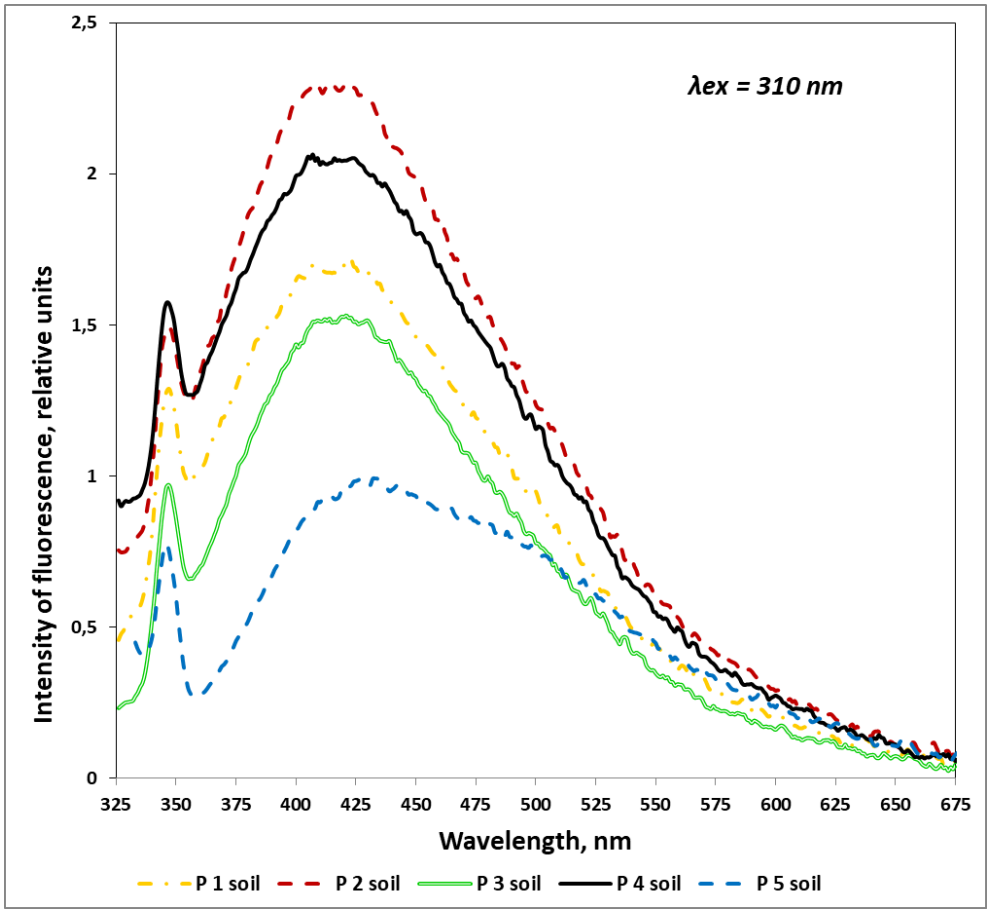


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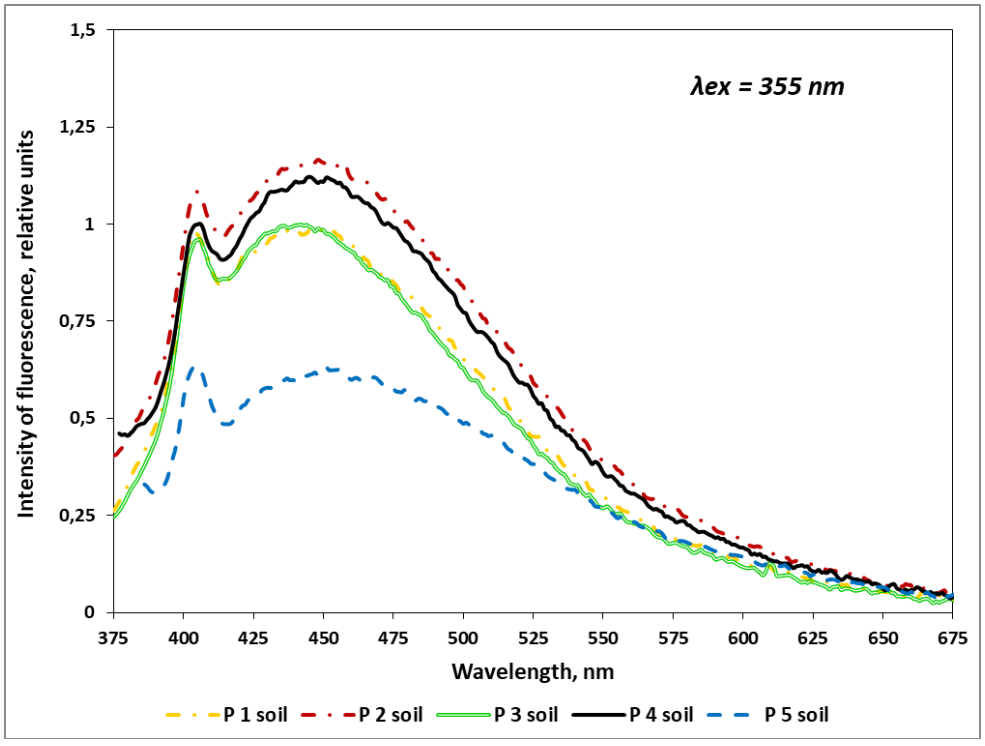


c

Figure 2 – Fluorescence spectra of soil water extracts (P.1-5 soil samples) upon excitation by a light wavelength of 270 (a), 310 (b) and 355 (c) nm

The fluorescence spectra of studied Almaty city's soil samples' water extracts represent a broad emission line maximum as for the natural humic substances. They depended on the excitation wavelength (figure 2). The maximum luminescence of humic compounds also depended on the excitation wavelength. When changing the excitation wavelength from 270 to 310 nm maximum of bands of emission was shifting towards shorter wavelengths, so-called "blue-shift" of emission spectra [7-9]. At that such "blue-shift" is most in evidence for the natural seawater samples, aquatic environment with microorganisms and uncontaminated soil water extracts. We should also mark out that it's practically absent in humic commercial solutions of coal origin [6, 8-10].

However, there are some fundamental differences in the fluorescence spectra of urban soil samples from P. 1-4 and natural humic substances. The additional peaks in the 330 ... 400 nm are revealed upon excitation by light with a wavelength of 270 nm in the fluorescence spectrum of the P. 1, 2, and 4 samples. This may be due to the presence of organic contaminants of anthropogenic origin.

For a detailed calculation of pollutants' luminescence spectral range the difference spectra were calculated: the difference of the fluorescence spectra between from P. 1-4 soil samples and P. 5 soil sample. Data are presented in figure 3.

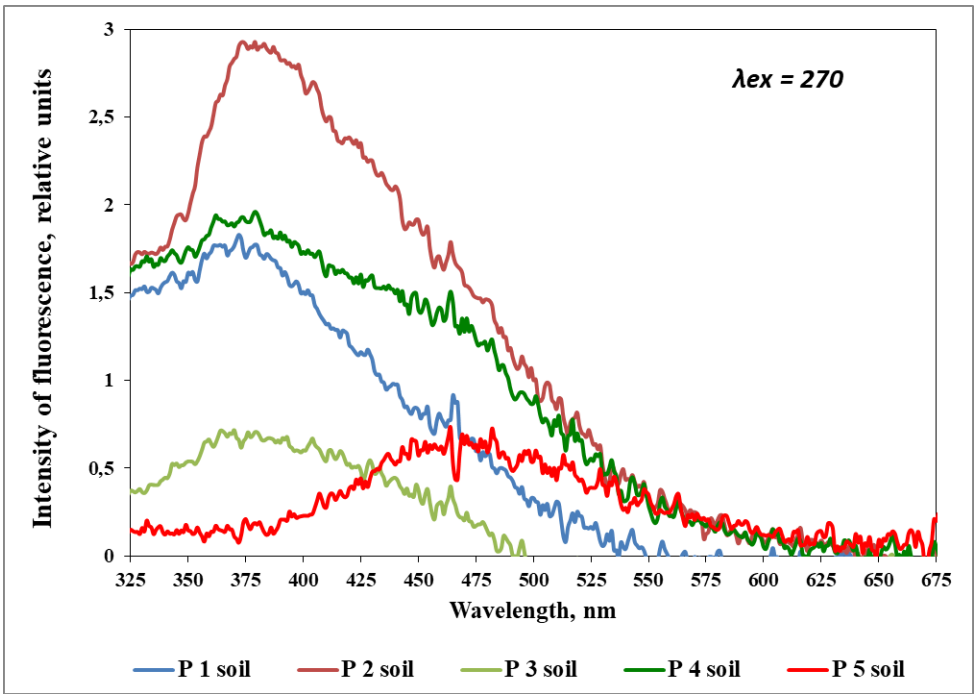


Figure 3 – The different fluorescence spectra of soil water extracts from P. 1-4 upon excitation by light 270 nm wavelength

Table 1 – Spectral-luminescence characteristics of Almaty city's soils water extracts

| Excitation wavelength $\lambda_{ex}$, nm | Sample from P. 1 | Sample from P. 2 | Sample from P. 3 | Sample from P. 4 | Sample from P. 5 |
|---|---|---|---|---|---|
| | Fluorescence quantum yield F, % | | | | |
| 270 | 4,8 | 4,7 | 2,8 | 3,4 | 1,6 |
| 310 | 4,2 | 4,3 | 2,5 | 3,0 | 1,4 |
| 355 | 4,5 | 3,8 | 3,6 | 2,5 | 1,2 |
| | Wave-length of maximum emanation, $\lambda_{em}$, nm | | | | |
| 270 | 400 | 404 | 443 | 449 | 457 |
| 310 | 423 | 415 | 422 | 417 | 436 |
| 355 | 440 | 450 | 440 | 450 | 457 |
| | Optical density D | | | | |
| 270 | 0,059 | 0,083 | 0,066 | 0,102 | 0,095 |
| 310 | 0,033 | 0,045 | 0,045 | 0,058 | 0,061 |
| 355 | 0,015 | 0,022 | 0,018 | 0,032 | 0,038 |

The values of the quantum yield of fluorescence are obtained as typical of humic substances for soil extract from P. 5. However, the fluorescence quantum yield was higher 1.5-3 times for soil samples from P. 1-4 than for background from P. 5. This could indicate the presence in soil samples of fluorescent compounds with a quantum yield greater than for typical soil humic substances, such as oil products, surfactants or other organic contaminants. It is possible that deviation from the norm caused by absorption and fluorescence of organic contaminants: petroleum hydrocarbons from car exhausts, as soil sampling sites were located close to the auto ways.

Thus, the soil samples were taken from 5 patches of the urban area along the highway with intensive traffic (Raimbek ave.) in the Almaty city. The significant soil pollution in Almaty city in the same patches by inorganic pollutants was found by earlier studies. In particular, by heavy metals through the assay the spectra of consumption of organic substances by bacterial communities [11].

According to presented fluorescence data these soil samples contained also organic pollutants. Presumably, these are petroleum products.

**REFERENCES**

[1] Khundzhua D.A., Patsaeva S.V., Terekhova V.A. et al. Spectral characterization of fungal metabolites in aqueous medium with humus substances // Journal of Spectroscopy. 2013. Vol. 1, Iss. 1. P. 1-7. DOI: 10.1155/2013/538608.

[2] Kalugin O., Asanov E., Iskanderov R. Method of georadiolocation in complex scientific applied researches // News of the National Academy of Sciences of the Republic of Kazakhstan. Series of Geology and Technical Sciences. 2018. Vol. 1, N 427. P. 49-60. DOI:10.1016/j.sbspro.2015.04.557. https://doi.org/10.32014/2018.2518-170X ISSN 2518-170X (Online), ISSN 2224-5278 (Print).

[3] GOST 17.4.3.01-83-SG SJeV 3347-82. Obshhie trebovanija k otboru prob. M.: Gosstandart SSSR, 1983. 57 p.

[4] Fedorec N.G., Medvedeva M.V. Metodika issledovanija pochv urbanizirovannyh territorij: ucheb. posobie. Petrozavodsk: Izd-vo KarNC RAN, 2009. 84 p.

[5] Beljaev A.B. Agrohimicheskij analiz pochv. Voronezh: Izd-vo VGU, 2008. 20 p.

[6] Gosteva O.Y., Izosimov A.A., Patsaeva S.V. et al. Fluorescence of aqueous solutions of commercial humic products // Journal of Applied Spectroscopy. 2012. Vol. 78, Iss. 6. P. 884-891. DOI: 10.1007/s10812-012-9548-8.

[7] Milyukov A., Patsaeva S., Yuzhakov V. et al. Fluorescence of nanoparticles of organic matter dissolved in natural water // Moscow University Physics Bulletin. 2007. Vol. 62. Iss. 6. P. 368-372. DOI: 10.3103/s0027134907060082.

[8] Shubina D.M., Jakimenko O.S., Pacaeva S.V. i dr. Spektral'nye svojstva vodnyh rastvorov promyshlennyh guminovyh preparatov // Voda: himija i jekologija. 2010. N 2-3. P. 22-26.

[9] Shubina D., Fedoseeva E., Gorshkova O., Patsaeva S., Terekhova V., Timofeev M., Yuzhakov V. The “blue shift” of emission maximum and the fluorescence quantum yield as quantitative spectral characteristics of dissolved humic substances // EARSeL eProceedings. 2010. Vol. 9, N 1. P. 13-21. http://www.eproceedings.org/static/vol09_1/09_1_shubina1.html

[10] Khundzhua D.A., Patsaeva S.V., Trubetskoj O.A. et al. An Analysis of Dissolved Organic Matter from Freshwater Karelian Lakes Using Reversed-Phase High-Performance Liquid Chromatography with Online Absorbance and Fluorescence Analysis // Moscow University Physics Bulletin. 2017. Vol. 72, Iss. 1. P. 68-75. DOI: 10.3103/S002713491701009X.

[11] Mynbayeva B., Seilova L., Amirasheva B. et al. Urban soil toxicity control via the evaluation of changes in bacterial communities’ metabolic spectra // African Journal of Microbiology Research. 2014. Vol. 8(5). P. 437-440. DOI: 10.5897/AJMR2013.6262.

[12] Mynbayeva B., Abisheva Z.M., Musdybayeva K.K. et al. Geographic and environmental assessment of the effects of heptyl pollution in Kazakhstan steppe regions // 17th Internat. Multidisc. Sc. GeoConf. “SGEM 2017”. 27 June- 06 July 2017, Bulgaria, Varna. 2017. Vol. 17. Iss. 52. P. 419-425. DOI: 10.5593/sgem2017/52/S20.054.

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## АЛМАТЫ ҚАЛАСЫНЫҢ ТОПЫРАҚТАРЫНЫҢ ЛАСТАНУЫН БАҒАЛАУДА ҚОЛДАНЫЛАТЫН ГЕОЛОГИЯЛЫҚ-МОРФОЛОГИЯЛЫҚ ЖӘНЕ ФЛУОРЕСЦЕНТТІК СИПАТТАМАЛАР

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**Аннотация.** Мақалада Алматы қ. топырақтарының табиғи гумустық заттардың белгілі спектрлерінен айырмашылығын анықтау үшін геологиялық-морфологиялық және спектралдық-оптикалық сипаттамалар бойынша мәліметтер келтірілді. Зерттеу объектілері болып Алматы қ. аумағының 5 учаскесінен топырақ үлгі-

лері мен су сорғылары алынды. Авторлар топырақ үлгілерінің геологиялық-морфологиялық және физико-химиялық қасиеттерін келтірді, оның 4 урбанозем және 1 - салыстыру үшін Алматы қ. 25 қашықтықта алынған фондық топырақ. Сіңіру жарығының толқын ұзындығы жоғарылаған сайын 4 учаскелердің қала топырақтарынан алынған топырақ сорғыларының флуоресценциясы мен сіңіру спектрлерінің оптикалық тығыздығы төмендегені көрсетілді, бұл гумустық заттарға тән сипат. Бірақ 270 нм толқын ұзындығымен қозғағанда урбанозем үлгілерінің флуоресценция спектрлерінде 330…400 нм аумағында тағы да қосымша шыңдар анықталды. Бұл шығу тегі антропогендік органикалық ластағыштардың болуымен түсіндіріледі: мұнай өнімдері, ПАВ немесе басқа органикалық ластағыштар. Нақтылау үшін урбанозем және фондық топырақтарының үлгілері үшін әртүрлі флуоресценция спектрлері есептелді. Сонда, фондық топырақтарынан алынған топырақ сорғылары үшін кванттық флуоресценцияның мәндері гумустық заттарға типтік болып келді. Урбанозем үлгілері үшін бұл мәндер 1,5-3 есе жоғары болды, бұл органикалық ластағыштармен байланысты.

**Түйін сөздер:** Алматы қ. топырақтарының геологиясы және морфологиясы, топырақтардың спектралдық флуоресценциясы, геоэкология.

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## ГЕОЛОГО-МОРФОЛОГИЧЕСКИЕ И ФЛУОРЕСЦЕНТНЫЕ ХАРАКТЕРИСТИКИ, ИСПОЛЬЗУЕМЫЕ В ОЦЕНКЕ ЗАГРЯЗНЕНИЯ ПОЧВ Г. АЛМАТЫ

**Аннотация**. В статье представлены данные по геолого-морфологическим и спектрально-оптическим характеристикам почв г. Алматы для установления их отличий от типичных спектров природных гумусовых веществ. Объектами исследований служили почвенные образцы и их водные вытяжки из 5 участков территории г. Алматы. Авторами представлены геоморфологические и физико-химические свойства почвенных образцов, 4 из которых отнесены к урбаноземам и 1 – к фоновой почве, взятой в 25 км от г. Алматы для сравнения. Показано, что оптическая плотность спектров поглощения и флуоресценции почвенных вытяжек 4 участков городских почв убывала с увеличением длины волны поглощаемого света, что характерно для гумусовых веществ. Однако при возбуждении светом с длиной волны 270 нм в спектре флуоресценции проб урбаноземов выявлены дополнительные пики в области 330…400 нм. Это может быть обусловлено наличием органических загрязнителей антропогенного происхождения: нефтепродуктов, ПАВ или других органических загрязнителей. Для уточнения были рассчитаны разностные спектры флуоресценции для проб урбаноземов и фоновой почвы. Оказалось, что для почвенной вытяжки из фоновой почвы получены значения квантового выхода флуоресценции типичные для гумусовых веществ. Для проб урбаноземов эти значения были выше в 1,5-3 раза, что связано с органическим загрязнением.

**Ключевые слова:** геология и морфология почв г. Алматы, спектральная флуоресценция почв, геоэкология.

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