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# Environment Impacts and Composition - Biotoxic Activity in Natural Hydrocarbon Raw Materials & Processed Products

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**Abstract**

*The paper aims to figure out What are environment impacts and composition - biotoxic activity in natural hydrocarbon raw materials and processed products. By using descriptive method for primary model, synthesis methods and process analysis and analysis of difficulties and discussion, The study of this problem point that, to assess the environmental impact of hydrocarbons on the biosphere, an accurate knowledge of the physical properties and chemical composition of oil and gas. Numerous tragic examples of accidents, such as those associated with a leak hydrogen sulfide gases. Hydrogen sulfide, due to its higher density relative to air settles in the lowlands of the relief, accumulating in calm weather in concentrations up to lethal. This leads to the death of animals and the death of people. The latter could be avoid by going to elevated windward areas, i.e., knowing the physical properties of this toxic gas.*

## Introduction

With a relatively small distance, for example, in suburban areas adjacent to large thermal power plants areas of agriculture, there is a change in the share of environmental pollution with metals toxicants from aerosol to wastewater and waste accumulated in landfills, ash dumps etc. The highest concentration activity in water bodies in relation to metals biotoxicants, in descending order: suspended matter, bottom sediments, plankton, immobile and sedentary benthos, fish and birds feeding on aquatic biota. For the purposes of the study, metals are of interest in significant quantities found in natural hydrocarbon raw materials and posing a serious danger to the environment. Anomalous contents of V and a number of other metals are known in the Pudozhgorsk area (Karelia) and Kachkanar (Urals). On the Onega Peninsula in the Medvezhyegorsk region in the 80s in the largest vanadium-uranium deposit was discovered in the basement rocks, relating to uranium reserves (but not standards) to the 5 largest deposits in the world. The Paper Presents Related Studies and Analysis With Environment Impacts And Composition - Biotoxic Activity In Natural Hydrocarbon Raw Materials And Processed Products.

## Methods

Authors have used qualitative and analytical methods, descriptive method for primary model, synthesis and discussion methods in this paper. We also used historical materialism method.

## Results and Discussion

Vanadium and nickel, and compounds belong to the 1st and 2nd hazard class, taking into account toxicity, cumulative and ability to cause long-term biological effects, including



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mutagenic. In combination with other metals, V and Ni can increase toxicity. So, for Ni in the air of the working area, the second hazard class is established, and for the connection with cobalt - Nickel carbonyl and tetracarbonyl Ni(CO)4 - the first. Established sanitary and hygienic standards in the Russian Federation for V: air in populated areas: MPCc 0.002 ,mPgC/cmo3st-0.06 mg/m3, MPCmr-0.5 mg/m3 ; water: maximum concentration limit - 0.05 mg/l, maximum concentration limit - 0.001 mg/l; soil - not established. For Ni: air in populated areas: MACs - for metallic Ni 0,.f0o0r1 mg/m3 soluble salts-0.0002 mg/m3 mg/l. Soil: MPC - 4.0 mg/kg , PCchr -0.001 mg/m3 . Water: MACv - 0.1 mg / l, MACvr (Ni 2+) - 0.01 Uranium (U) and thorium (Th). The property of these elements is the ability to spontaneous nuclear fission with the release of energy. Significant number of industrial uranium deposits associated with rocks enriched in organic matter and hydrocarbons. Among the various types of uranium mineralization emit uranium and vanadium-uranium mineralization associated with heavy oil and bitumen.

The content of U in bituminous rocks of individual ore occurrences exceeds 2%. Elements satellites - Ni, Co, Pb, Zn, Mo, Cu, Hg, As, Ag, etc. In compounds of uranium with sulfur and a number of others impurity components in hydrocarbons, the toxicity of the metal increases.

Uranium, like thorium, is highly toxic, both belong to the first class of danger. Render general toxic, carcinogenic, mutagenic action. Causes necrosis of blood vessels kidneys. MPCmr - 0.075 mg/m,3MPCv - 0.05 mg / l. Lead (Pb). Soft, ductile, bluish-gray metal. Contents in hydrocarbons - up to the first g / t. Mass distribution in the composition of hydrocarbon motor fuels Pb is due to artificial additives tetraethyl lead - ÿb (ÿ2ÿ5) 4 in fuel as an anti-knock additive (DeFelipe et al., 2022).

Chromium and compounds are assigned to the second hazard class, but they are converted in a humid environment in CrO3(OH), the compound becomes highly toxic. oxide) - 0.0015 mg/m3 . Water: MPCv-0.05 mg/l; MPCvr- (according to Cr6+ and Cr3+) -0.001 and 0.005 mg/l. Soil: MPCp- (according to Cr6 +) - 0.05 mg / kg.

Zinc (Zn). Silvery white metal. Zn is common in oil. Contents in main grades of crude oil consumed in Western Europe are 116-500 g/t, the Zn content in Russian export grade "Urals" - 380 g/t (Huy & Hien, 2010). The metal is migratory active both in surface and underground waters. Chief The natural precipitant of Zn is hydrogen sulfide. Forms stable compounds with hydrocarbons (zineb) (Huy et al., 2021). Zinc is a bioactive element (Huy, 2012). Zn-concentrating plants are known. metal active accumulates in soils and is poorly removed (Haag & Anderl, 2018).

Zinc airborne aerosols consist predominantly of submicron particles with a diameter 0.5-1 microns, which enhances the negative impact. Zn is assigned to the second hazard class. Zinc and compounds affect the hematopoietic system, liver, kidneys (Huy, 2015).

Established sanitary and hygienic standards in the Russian Federation: air: MPCrz - (according to zineb) 0.5 m, g / m3 MPCs - (according to oxide) 0.05 mg / m3 ; water: MPCv - (for Zn) - 0.1, (for zineb) 0.03 mg / l; MPCvr - 0.01 and 0.05 (for sea water) mg / l; soil: MPCp - (according to mobile forms) 23.0 mg / kg. Molybdenum (Mo). Light gray metal. Mo and compounds in hydrocarbons are stable and inactive.

But with high-temperature sublimation (400-600 ° C), it passes into volatile forms associated with S, M, C, or forms oxides - MoO3 and MoO2. The content of Mo in oil, as a rule, does not exceed 2–10 g/t. But in the asphaltites of the content molybdenum can increase up to 50 g/t. The background content of Mo in natural waters is 0.012 mg/l. Mo, as well as compounds, are assigned to the third hazard class, soluble compounds of second. The discussion of



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molybdenum in this list is due to the fact that in compounds with sulfur and a number of metal impurities in oil, their combined toxicity increases. Mo renders general toxic, carcinogenic, mutagenic action.

Established sanitary and hygienic standards for Mo in the Russian Federation: air: MPCrz - 4 m,gP/mKh3r- 1.2-1.6 mg/m3 ; water: MPCv - 0.25 mg / l, MPCvr are set according to M6+o-0.0004 mg/l; soil: MPCv -10.0 mg/kg (Germany standard, not established in the Russian Federation).

Cobalt (Co). Silvery white metal with a slight reddish tinge. In natural hydrocarbons contained in small quantities - up to the first g / t. Has the ability concentrate in heavy oil residues, fuel oils. Air aerosols of cobalt consist of coarse particles - more than 1 micron. They are are formed during the combustion of diesel and boiler fuel, oil residues. Quantity cobalt in total atmospheric emissions from fuel combustion is 3-8 times higher than the world prey.

Cobalt, like most of the impurity metals discussed, is biologically active. component. Cobalt, for example, is part of the cobalamin enzyme. When hit in the body of significant doses of Co is a metabolic disorder. An example of cobalt poisoning is the death of 20 out of 48 people who drank beer, where Co was added in concentration 1 ppm for "foam stabilization" (Modern problems of studying and preserving the biosphere, vol. II, Living systems under external impact. / Ed. Krasnogorskoy N.V. - St. Petersburg, Gidrometeoizdat, 1992). CO is highly toxic, has a general toxic, irritating, allergenic, carcinogenic, mutagenic action. In combination with As and S, the toxic effect is enhanced. Co assigned to second hazard class, some cobalt compounds - to the first.

Established sanitary and hygienic standards in the Russian Federation: air: MPCrz - for Co (Cu4) 2 - 0.01 mg /m3 ; MPCc - 0.001 - mg/m3 ; water: maximum concentration limit - 0.01 mg/l; MPCvr - 0.01 (0.005 for sea water) mg/l; the soil: MPCp - not installed.

Copper (Cu). Soft malleable red metal. Copper is common in oil. Content in grades of crude oil consumed in Western Europe are 21-195 g / t, the content in Russian export grade "Urals" - 51 g / t, table 25. Cu content within one field and applied stimulation methods can vary widely. So, oil of the productive field of the Yaregskoye oil field, contain 10 - 29 g/t of metal.

The content of Cu in the neighboring, little developed Lyayolskaya area of the same deposit - in lighter oil 28 - 86 g/t.

Copper is a pronounced bioactive component, it is well accumulated by soil and biota, naturally excreted slowly. Air aerosols of copper consist mainly of from submicron particles with a diameter of 0.5-1 microns, which allows it to spread in the air to significant distances.

Copper and a number of compounds are assigned to the first (copper-chromium-barium catalyst), third (ÿu2+) and fourth (copper-nickel ores) hazard classes. Toxic, renders general toxic, irritating, mutagenic action. Known disease "copper fever", expressed in a disorder of the nervous system, fever, impaired liver and kidney function, etc. Established sanitary and hygienic standards in the Russian Federation: air: MPCmr - (for copper sulfate) - 0.0,0M3 PmCgs/sm-3(for copper oxide) 0.002 mg/m3 ; water: MPCv - 0.1-0.5 mg / l, MPCvr - 0.005 (for sea water) mg/l; soil: MPCp - (for mobile forms) - 3.0 mg / kg.

The above information about the biotoxic activity of a number of elements and compounds, common in natural hydrocarbon raw materials, far from exhaust their properties and list.



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Only the most common and studied of them are noted. It is obvious that in. This list will be expanded in the future. But it is important to re-emphasize the broad distribution of a significant number of PTEs in hydrocarbon raw materials and processed products. It has already been emphasized above that the most toxic PTEs are in the form of sulfur connections. The formation of PTE can occur directly in humid air. The environment surrounding TPP, fly ash microparticles and significant volumes, released into the atmosphere during the combustion of sulfurous coals or fuel oils. For example, a thermal power plant with an average capacity for coal of 2 million tons / year, with a content of 2% sulfur in coal, they are emitted into the air at least 80 thousand tons. As a result, not only "sour" rains fall on the soil, but also sulfur and oxide PTE compounds present in fuel. Environmentally heavy meteorological situations during smog in urban agglomerations and industrialized regions is a direct consequence of these processes.

Along with the depletion of resources of traditional, relatively safe oil for environment, production of heavy oil and oil sands will increase, often enriched with biotoxic elements and sulfur. Therefore, it is necessary to timely standardize methods and expand the range of both chemical-analytical and medical biological studies of hydrocarbons of raw materials and processed products, so as not to aggravate unfavorable ecological situation, especially in the central, most populated regions of Russia with high energy consumption and many facilities using fuel oil enriched with both PTE and S compounds.

It is also worth emphasizing that even for the most studied elements and compounds. We must take into account that methodically express analytics, often used for quantitative estimates of the presence of impurity components in the analyzed medium is far from perfection. We have to deal with low metal contents, especially volatile, when determined in ashes, or during sample preparation by decomposition by mixtures strong acids. Methods of analyzes are being improved, but distributed mainly for precision, i.e. rare and expensive types of research. Therefore, when characterizing content of biotoxicants in oil, bitumen, processed products account for focus on the accumulated information of past years, based, in part, on outdated methods of analysis 1.

## Conclusion

The level of knowledge of impurity components in oil is also insufficient, within even explored deposits. More often they are limited to the analysis of produced oil as a commodity product, and in fact the composition of hydrocarbons is often variable within the deposits themselves, and, consequently, in production dynamics. For illustration, we present the results of precision studies metal content in oil, performed by M.V. Torikova et al. in 1996. The oils of the Anastasyevsko-Troitskoye field in the West Kuban trough were studied. The content of metals in different parts of the oil substance was studied separately: in asphaltenes of oil and in flocculent oxidized oil suspension near the OWC of the deposit. In asphaltenes of oil in the developed part of the deposit, the highest concentrations were noted for (g/t): Zn - 860; Co - 67; Ag - 100. In asphaltenes of oil in the near-contact oil-water zone: Au -; W 7.9. The highest contents and the widest range of rare earth elements and metals measured in carbonaceous matter (insoluble sediment) of oil at OWC (g/t): Sr — 1190; Rb - 62; Cs - 3.5; Sb - 9; La-41; Se - 82; Nd - 50; Sm - 7; Eu - 1; Yb-5; Lu - 0.9; Tb - 0.6; sc- eight; Cr - 290; U - 7.2; Hg - 5.6; Al and Fe - up to 10%, Ca, Na, K - up to 5%. We also emphasize wealth these elements and formation waters in contact with deposits (Bauer et al., 2021). The latter allowed the authors to draw a conclusion about the relationship between the processes of accumulation of metals in oil and formation waters. But, apparently, one should not exclude the possibility of mutual influence of oil and water in the contact zones on basis of diffusion and epigenetic processes.



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As can be seen from the list, the richness of oil in microimpurities of various elements - is indisputable, but the analyzes themselves with the completeness of the studies, similar to those given above, to unfortunately too few.

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**Conflicts of Interest**

There is no conflict of interest

## References

Bauer, P., Dueben, P. D., Hoefler, T., Quintino, T., Schulthess, T. C., & Wedi, N. P. (2021). The digital revolution of Earth-system science. *Nature Computational Science, 1*(2), 104-113.

Boschert, S., & Rosen, R. (2016). Digital twin the simulation aspect. *In Mechatronic futures* (pp. 59-74). Springer, Cham.

Hang, B. T. T., Huy, D. T. N., An, P. T., Ngoc, N. T. B., & Duyen, H. T. M. (2020). Current situation of Bitcoin management and use: perspectives from the world and recommendations for vietnam. *Management, 24*(2).

Haag, S., & Anderl, R. (2018). Digital twin–Proof of concept. *Manufacturing letters*, *15*. 64-66.

DeFelipe, I., Alcalde, J., Baykiev, E., Bernal, I., Boonma, K., Carbonell, R., ... & Ventosa, S. (2022). Towards a Digital Twin of the Earth System: Geo-Soft-CoRe, a Geoscientific Software & Code Repository. *Frontiers in Earth Science*, 509.

Huy, D. T. N. (2015). The critical analysis of limited south asian corporate governance standards after financial crisis. International Journal for Quality Research, 9(4), 741.

Huy, D. T. (2012). Estimating Beta of Viet Nam listed construction companies groups during the crisis. Journal of Integration and Development, 15(1), 57-71.

Huy, D. T. N., & Hien, D. T. N. (2010). The Backbone of European Corporate Governance Standards After Financial Crisis, Corporate Scandals and Manipulation. *Economic and business review, 12*(4), 1.

Huy, D. T. N., Le, T. H., Hang, N. T., Gwoździewicz, S., Trung, N. D., & Van Tuan, P. (2021). Further researches and discussion on machine learning meanings-and methods of classifying and recognizing users gender on internet. *Advances in Mechanics, 9*(3), 1190-1204.



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