

Главным результатом является доказательство протекания реакции окисления красителя кислородом, происходящая одновременно с восстановлением красителя кислотой. Описан механизм реакции - внутри реакционной среды должны накапливаться промежуточные продукты реакции (радикалами).

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STABLE LEAD ISOTOPIC RATIOS IN SURFACE DEPOSITED SEDIMENT AS INDICATOR OF URBAN GEOCHEMICAL PROCESSES

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The objective of the study was to assess the isotopic ratios Pb-204/Pb-206, Pb-207/Pb-206, Pb-208/Pb-206 and analyze their availability to indicate contemporary geochemical processes in urban surface deposited sediments. The study was conducted on the example of five Russian cities.

Urban surface deposited sediments (USDS) play an important role in the processes of geochemical transformation of the urban environment [1]. The content of heavy metals in the sediments is the indicator of environmental aspects of this transformation. When studying the pollution of the sediments with Pb, the additional information is provided analyzing the relations with Pb stable isotopic ratios. The isotopic ratios Pb-

204/Pb-206, Pb-207/Pb-206, Pb-208/Pb-206 were determined in the surface sediments from five Russian cities: Nizny Tagil (48 samples), Ufa (43), Magnitogorsk (41), Tyumen (42), and Chelyabinsk (60). The USDS samples were collected during the summer period 2016-2018 from local surface depressed areas of microrelief in residential districts of the cities. The concentrations of typomorphic macro- and microelements, potentially harmful elements (Pb, Cu, and Zn) were also measured in the collected samples. At the first stage of the analysis, the initial geochemical baseline conditions for USDS were determined. A part of the samples was classified as polluted with Pb; for a part of the samples, no changes in the initial geochemical conditions were found. An analysis of Pb isotopic ratios for 'polluted' and 'clean' samples allowed drawing the following conclusions. In a group of polluted samples compared to clean in all cities, there is a decrease in the relative contribution of Pb-206 to total Pb content compared with Pb-204, Pb-207, and Pb-208. In the group of samples polluted with Pb, isotopic ratio Pb-208/Pb-206 is shifting towards the values characteristic to leaded gasoline which was used in Russia before 1995: isotopic ratios in A-76 gasoline Pb-207/Pb-206 - 0.8811, Pb-208/Pb-206 - 2.129. For example, in Ufa, the ratios Pb-207/Pb-206 and Pb-208/Pb-206 in clean samples were 0.849 and 2.085, respectively, when 0.857 and 2.100 in polluted respectively. The shift in isotopic ratios was the same in all cities. In Nizhny Tagil the largest ratios of Pb-207/Pb-206 were obtained both in polluted and clean samples in comparison with other cities. Nizhny Tagil is one of the cities with the highest levels of Pb pollution in Russia. Thus, in the cities, there was pollution of surface sediment with Pb, which may be associated with the use of leaded gasoline as fuel for vehicles before it was banned. Lead is still remaining in the environmental compartments in an urban area. The analysis confirmed that USDS is a sensitive indicator of the environmental state of the urban environment.

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