

Fate and migration of pollutants in the main river waters of Central Asia

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Solution of problems of monitoring and protection, and rational using of river waters requires studying of space-temporarily distribution and migrations of pollutants, such as heavy metals (HM). It is also important to have exact information about forms of being HM because their fate, behavior, migration, and their toxic property are connected with their physic-chemical forms. But not enough sensitivity and accuracy of many physic-chemical methods of analysis requires necessity of developing and using of high-sensitive and multi-component methods of determination of contents and migration forms of HM in nature and sewage waters.

Studying of migration forms of HM in the river waters was conducted by the following scheme: Neutron-activation analysis of divided fractions of separate forms of HM; experimental modeling by using of appropriate radio nuclides and thermodynamic modeling methods.

There was developed and used neutron-activation method for getting quantitative data about forms of being HM in water. The ultra-filtration and electro-dialyze fractionating and concentrating of separate forms of HM was carried out before neutron activation analyses. There were established optimal conditions of division form of being of HM by using radionuclides ^{60}Co , ^{51}Cr and ^{124}Sb in cationic and anionic forms.

During 2003-2005 we have studied space-temporarily variations of content and phase distribution of Hg, Zn, Cd, Sb, Co, Th, Br, Cr, Au, La and Eu in the waters of Amudarya, Syrdarya and Surkhandarya rivers. Average concentration of HM fluctuates from 4.1 mg/l for Fe, till 2 ng/l for Au.

Suspended composing of river waters makes from mountain rock and lands in river-heads and concentration of elements in weight form not exceeding the level of clark's contents.

In formation of solved phase of river water main role plays atmospheric precipitation. This fact concern to the technogenic elements (Hg, Cd, Zn, Sb, Cr, Se, V) mainly. Limits of determination of HM – 10^{-6} - 10^{-10} g/l. Relative mistake of definition of 20 HM, including Hg, Zn, Cd, Sb, Co, U, Br and Cr in the river and sewage waters makes 10-25%.

It was established that researching elements in river waters migrates in suspended, colloid, cationic, anionic and neutral forms. Contents of colloid form of HM fluctuates between 5% and 20%. A comparable low contents of organic matters in river waters of arid zones stipulates perceptivity of applying of thermodynamic methods in studying of being forms of HM. The thermodynamic calculations for determination being forms of HM in river waters was also carried out.

On the base of experimental data and thermodynamic modeling, It was established that in distinction of river waters of humid zones, in migrations of HM in surface water in arid zones main role plays inorganic ligandas (OH^- , SO_4^{2-} , Cl^-). Received results about forms of being HM and radionuclides may be the base for developing the technology of water preparation on water-pipe stations of researched rivers, and for effective clearing water from HM and radio nuclides.

In the report in detail discussed data about laws of distributions and migrations of HM in river waters of Amudarya, Syrdarya and Surkhandarya.

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