Accumulation of trace elements in the Lake Baikal biota

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The objective of the work was to assess accumulation of chemical elements by different hydrobionts' species and to find out a role of biota in removing trace elements from the lake water. Contents of about 30 trace elements were studied in 1979–1987 in plankton, benthos species (hammaridae, polifera, molluscs), most common food fish and in Baikal seal. The full set of AE-, AA- and NA-analytical techniques was used.

Accumulation factors (AF, the ratio of element concentration in dry tissue to that in water dry residue) for 28 metals (Na, Al, Sc, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Br, Rb, Sr, Mo, Ag, Cd, Sn, Sb, Cs, Ba, La. Ce, Hg, Pb, Th, U) and Br showed that there was no regular rise of a metal concentration in dry biomass when going from an initial producent (phytoplankton) up to ultimate consument (seal). From all 29 considered elements only Rb revealed a tendency to increasing bioavailability from lower trophic levels to upper ones. As a rule, changes in AF's for other elements do not show any certain regularity depending on trophic levels.

The following metals have highest AF: in phytoplankton (AF > 30) – Al, Fe, Pb; in zooplankton (AF > 10) – Al, Fe, Cd, Ce, Hg, Pb; in molluscs (flesh, AF > 100) - Al, Mn, Fe; in seal (flesh, liver, AF > 50) - Al, Fe, Cd. Metal accumulation in fish tissues is relatively low, AF exceeds 5 only for Al, Mn, Fe, Ce.

Estimates of metal flux rates to bottom sediments were calculated on the basis that the input of autochtonic organic matter to sediments was equal to 800.000 ton/year resulting mainly from phytoplankton annual primary produce. These flux rates should be considered as semi-quantitative major estimates which just indicate that uptake of some metals (Na, Cr,u, Zn, Sr, Ag, Cd, Sn, Sb, Hg, Pb, U) by phytoplankton can be a significant route to their removal from the waterbody to the bottom sediments.

Monitoring the stability of scale inhibitors by ATR-FTIR at high pressures and temperatures in synthetic geothermal fluids

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Mineral precipitation (scaling) such as sulfates, carbonates, and oxides are well known phenomena in geothermal plants. These precipitations damage plant equipement (e.g. heat exchangers) or reduce the injectivity of the reservoirs and thus the operation liftime of such installations. In this context, the use of environmental friendly inhibitors to avoid the formation of these mineral precipitations become attractive.

In this study, scale inhibitors based on ecologically harmless polycarboxylates are examined with respect to their thermal stability by attenuated total reflection - Fourier transform infrared spectroscopy (ATR-FTIR). The spectroscopical device is equipped with to a high pressure - high temperature reaction cell that allows measurements at up to 200 °C 200 bar. In this study, changes in signal intensity and band position for various inhibitors were monitored dependent on temperature and pressure. Additionally, the behavior of scale inhibitors in synthetic fluids at different ionic strenghtes (up to 5M NaCl) is evaluated as a function of temperature and pressure.

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