

Transboundary problems of water resources quality in the Selenga river basin

I.D. ULZETUEVA*, D.TS.-D. ZHAMYANOV,
B.O. GOMBOEV AND V.V. KHAKHINOV

Baikal Institute of Nature Management SB RAS, 8,
Sakhyanova Str., Ulan-Ude, 670047, Russia
(*correspondence: idulz@mail.ru, dabaj18@yahoo.com)

The Selenga river basin occupies the territory of 447060 km² and it is divided by two countries – Russia and Mongolia. 67 % of territory is situated in Mongolia, 33 % - in Russia [1].

From 2007 to 2009 years the Baikal Institute of Nature Management together with Korea Environment Institute, Institute of Geocology of Mongolian Academy of Sciences have carry outed 3 scientific expeditions in the territory of Selenga river basin (in territory of Russia and Mongolia) within the scope of the International project 'Integrated water management model on the Selenge river basin' for social and economic information collection and water sampling.

We studied the identification of the general content of 15 microcomponents (Fe, Cu, Mn, Zn, As, Mo, Al, Pb, U, Cd, Ni, Co, Cr, Ag, Au) in 30 samples in water objects of the Selenga river basin: 16 from which are selected in territory of Mongolia, on river Selenga inflows – Orkhon, Tuul, Kharaa, 14 in Republic of Buryatia (Russian Federation) – in waters the river Selenga, and on its inflows – Uda, Dzhida, Modonkul.

The investigated waters of the Selenga river basin are alkaline and low-mineralized, concerning to hydracarbonate class of calcium group and have a favorable oxygen mode. Reduction of concentration of the main ions downstream the river is connected with effect of dilution by waters of inflows which have a smaller mineralization.

Results of researches of the Selenga river basin water quality have shown that the basic pollutants are metals: copper, iron, zinc, arsenic, aluminium, manganese, molybdenum, uranium.

Almost all water objects do not correspond to the requirements of water objects quality of fishery purpose (in Russia the rivers of fishery purpose have the highest standards on water quality, the river Selenga in the territory of Russia is the water object of fishery purpose). The Most polluted rivers are Tuul, Kharaa, Modonkul which basins are the most influenced by industrial regions, and also mining enterprises.

[1] *The Ecosystems of Selenga basin.*—Moscow, Nauka, 2005.

Release mechanisms of Sr and Cs from the weathered Hanford sediments

W. UM^{1,2*} AND H-S CHANG³

¹Pacific Northwest National Laboratory, Richland, WA, USA
(*correspondence: wooyong.um@pnl.gov)

²Pohang University of Science and Technology, South Korea

³Savannah River Ecology Laboratory, Aiken, SC, USA

Introduction

Various aspects of the acute effects of the released high level radioactive waste on sediments, including mineral weathering and contaminant transport have been extensively investigated at the Hanford Site. However, the long-term behavior of radionuclides in the contaminated sediment after the removal of the caustic source is not as well studied. Sediment pore water is expected to return to conditions of circumneutral pH and low ionic strength after long times, but the possibility exists that radioactive contaminants sequestered in the impacted sediments might be remobilized by the change in subsurface geochemical conditions.

Results and Discussion

The leaching behavior and release mechanisms for Sr and Cs from the unsaturated columns packed with the two weathered Hanford sediments was modeled using the CrunchFlow code, which represented the reaction network as a combination of mineral dissolution/precipitation and ion exchange reactions. The leach tests were conducted using background Hanford pore water with focus on the first 200 pore volumes. The weathered sediments were prepared by reaction for 6 months with a synthetic Hanford tank waste leachate containing stable Sr and Cs (10^{-5} and 10^{-3} molal representative of LOW- and HIGH-weathered sediments, respectively) as surrogates for ⁹⁰Sr and ¹³⁷Cs. The mineral composition of the weathered sediments shows that zeolite (chabazite-type) and feldspathoid (sodalite and cancrinite) are the major byproducts. However, the amount of secondary minerals in the sediments varied depending on the weathering conditions. Reactive transport modeling indicated that the leaching behavior of Cs was controlled by ion exchange, while Sr release was affected primarily by dissolution of the secondary minerals. The release of K, Al, and Si at later times in the leaching experiment using the HIGH-weathered sediment indicates additional dissolution of a more crystalline mineral (cancrinite-type). A two-site ion-exchange model successfully simulated the behavior of Cs release in the LOW-weathered sediment column. However, a three-site ion-exchange model was needed to describe Cs release in the HIGH-weathered sediment column.