Influence of natural organic acids on the leaching of major and trace elements from the rocks

A.V. SAVENKO* AND V.S. SAVENKO

Moscow M.V. Lomonosov State University, 119991, Moscow, Russia (*correspondence: Alla_Savenko@rambler.ru)

One of geochemical mechanisms of biosphere homeostasis is weathering of the rocks at the active participation of living organisms metabolites and products of organic matter destruction, in particular low-molecular carboxylic acids and products of their polymerization. Aggressivity of dissolved organic matter to the rocks is caused basically action of the functional groups. It has allowed to lead the experimental modeling of leaching of major (Na, K, Mg, Ca) and trace (Li, Rb, Cs, Be, Sr, Ba; Mn, Fe, Co, Ni, Cu, Zn, Cd, Tl, Pb; Y, REE, Ti, Th, U; F, Si, P, V) elements from the rocks of various basicity (meimechite, basaltic andesite, albitized rhyodacite, and alkaline agpaitic granite) by distilled water and multicomponent solution of organic acids, in which the frequency distribution of dissociation constants of carboxyl groups correspond to that of natural soil solutions.

It is established that relationship of difference of elements *i* concentrations in the experiments with organic acids solution and distilled water ($\Delta[i] = [i]_{DOM} - [i]_W$, μg/l) from the solid phase content (*m*, g/l) was described by hyperbolic function for all studied samples:

$$\Delta[i] = A_i m / (1 + B_i m), \quad (1)$$

where A_i and B_i are constants. Analysis of the obtained data has revealed close correlation (r = 0.86–0.90) between logarithms of parameter A_i in the equation (1) and contents of elements *i* in the rocks $C_{i(\text{rock})}$, % wt:

$$A_i = \lambda_i C_{i(\text{rock})}^{q_i}, \quad (2)$$

where λ_i and q_i are constants which values are close for various rocks (table). Parameter A_i describes mobility of elements *i* at the initial stage of leaching when only small amount of organic acids has react and $B_i m << 1$. The generality of dependence (2) for different elements indicates that specificity of their chemical properties has no crucial importance at the beginning of leaching process. It is possible in that case when dissolution of rock-forming minerals goes not selectively.

Rock	$\log\lambda_i$	q_i
Meimechite	1.99	1.31
Basaltic andesite	1.69	1.48
Albitized rhyodacite	1.94	1.48
Alkaline agpaitic granite	1.37	1.31
Average	1.75±0.28	1.40±0.10

Table: Values of λ_i and q_i coefficients for various rocks.