THE MAIN FUNDAMENTAL PRINCIPLES OF CRIOGEOCHEMISTRY

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On the basis of the great information the main criogeochemical principles were formulate.

The history of the formation of criogeochemistry as a scientific direction has more than 60 years and is associated with the names: P.B. Weinberg, V.I. Arabadji, N. Tsytovich, A. Ananyan, B.R. Puri, O.P. Ivanov, S.L. Shvartsev, I.A. Tutunova, V.M., Pitulko, P.F. Shvetsov, A.P. Borovoi, G.B. Bokii, V.G. Grigorieva, M.M. The O. Derbeneva, B.N. Dostovalov, A.V. Ivanov, R.I. Korkina, V.N. Makarov, Z.A. Nersesova, V.P. Romanov, A.L. Osborn, L.V. Chistochinov, G.A. Yurgenson and others.

1.When ever possible on the Earth's surface low temperatures some, part of the water is in a liquid state. This can either be volumetric moisture in the form of concentrated brine, or film moisture in the intergranular space of rocks or ice. The freezing point depression of water in fact, and in another case caused by a decrease in chemical potential due to the binding of water molecules to mineral surfaces or dissolved substance. Therefore, the solute and the surface of the mineral particles are in a sense competitors. The presence of liquid water determines the possibility of chemical reactions at low temperatures in the system "water – rock". This concentration of solutions in the field of negative temperatures helps intensification chemical reaction.

2. The mobility of chemical elements at low temperatures other than positive. Thus, the mobility of sodium, calcium, zinc, cobalt in the permafrost decreases and of bismuth, tin, antimony, arsenic, waist, mercury, silver, chromium, beryllium, aluminum, iron, titanium increases. Some information on the mobility of chemical elements in seasonally-users can find all the layer of permafrost may carry data on their oreolah scattering.

3. The intensity of the processes of chemical weathering at low temperatures increases due to exothermic effects of the reactions; the temperature fluctuations inside the negative region; electrochemical phenomena; cryogenic concentration of the leaching solutions; catalytic effects in complex solvents.

4. Frozen, contains ice rocks are not impervious to concentrated solutions. The speed of gravity migration of such solutions according to our experimental data and estimates by other authors is around 15 – 20 cm per year in the absence of fracture. At about the same speed nonfreezing solutions can move up to the surface due to the capillary forces. The predominant direction of moisture movement depends on the state of the earth's surface (evaporation).

5. By freezing the aqueous solution at the water-ice occurs the jump of the electric potential, the magnitude of which depends on the composition of the solution. At some specific composition of the solution (for each system) the interfacial potential gradient disappears. This condition is called "point of zero charge". In the process of freezing dilute solutions there is a potential of freezing, which leads to the formation of extremely concentrated solutions of film as a result of redistribution of ions between liquid and solid phases (the effect of Workman – Reynolds).

6. Specifics criogeochemical systems and processes is the reason for the formation of a kind of zoning in the composition of the pore waters, and secondary minerals in cryogenic weathering crusts and the oxidation zones of ore deposits. For cryogenic oxidation zones of ore deposits characterized by the formation of minerals with water of crystallization.

7. At negative temperature (if constant) the leaching process in the "solution – rock" takes place at a constant concentration of the reagent that is provided by the process of cryogenic

concentration. The decrease of reagent in the process of interaction "solution – rock" reduces the amount of non-freezing water phase. Thus, the crossing of 0ºC fundamentally changes the hydrogeochemical system. Therefore, physicochemical models developed for the region of positive temperatures, cannot be used to describe criogenic processes.

8. From the thermodynamics point of view of permafrost zones are defined as little studied systems that involve a number of difficulties. However, the procedure for the study and description of geochemical processes in conditions in permafrost areas, combining computer physicochemical modeling and classical geographic information systems with a view to quantifying and mapping the results obtained was proposed and tested by the authors.