DISTRIBUTION OF BORON BETWEEN THE LIQUID AND GAS IN PRESENT HYDROTHERMAL SYSTEMS

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Distribution of components between gas and liquid on present hydrothermal systems allows to explain laws of formation of their elemental composition. During field operations we investigate sources of hydrothermal systems of Kamchatka: Ground field of Mutnovskiy volcano, Dachniy sources (9 km to the north from Mutnovskiy volcano), caldera Uzon, Valleys of Geysers and Academies of Sciences. Sources differ on an elemental composition, composition of gases and mineral specialization. Samples were selected from spontaneously bubbling up sources with the temperature close to boiling of water.

The traditional technique of selection of condensates with use gas-collecting funnel results in to pollution of condensates of gases by droplets of a solution. It is estimated under contents Na and Cl in water of a source and the selected sample and makes 1-3 %. For removal of pollution we had been designed system from stainless steel in which reflectors and a dephlegmator (fig.1) are positioned. The temperature was supervised by a temperature-sensing element; the case became covered by a thermal protection from polyurethane foam. Pollution of sample by drops in installation does not exceed 0.1 %. The method of sample drawing shows good reproducibility.

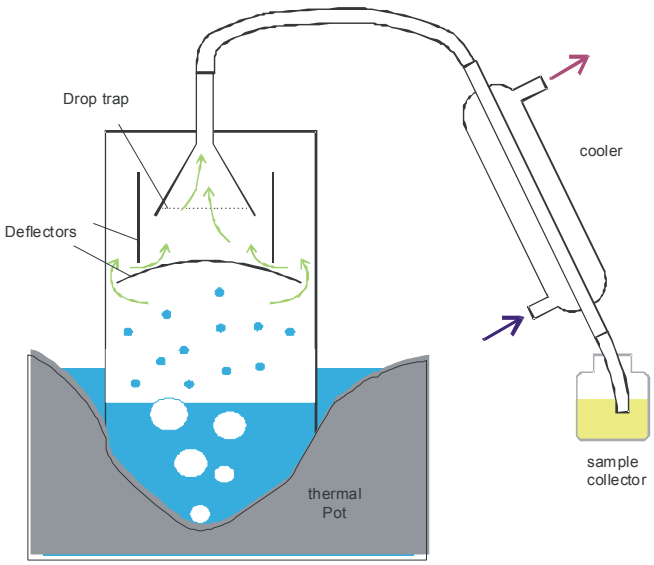

Fig. 1. The schema of installation for selection of a condensate

For validation sample selection in laboratory conditions experiment by definition of a distribution number of boron between gas and a liquid for solutions of various compositions has been spent at 100°C. Results have shown good convergence with independent data.

Boron in water and condensates was determined by a colorimetric method with H-rezorcine and ISP-MS. The data received by us at analysis of distribution of boron between a liquid and gas, have appeared rather ambiguous (fig.2). So, for samples from sources caldera Uzon and Valleys of Geysers distribution of boron has appeared in favour of a fluid phase that corresponds to experimental data. For other systems studied by us the return result has been received, that is distribution of boron has appeared in favour of a gas phase.

Except for boron of sample of water and condensates for sources of the Academy of Sciences have been analyzed on some other elements by method ICP MS. By results of these analyses seeming distribution numbers of elements between gaseous and liquid phase have been calculated K*D=Ci (condensate)/Ci (solution) (fig.3). For sources of the Academy of Sciences the increased distribution number gas-liquid is discovered by fluid phase K*D=Ci for As, Sb, Zn, Cu, Cd. Hydrotherms of Mutnovskiy volcano

have other set of "anomalous" elements - Zn, Cd, Sb, and As is mainly distributed in a fluid phase. Research of condensates of gases modern a hydroterm allows to estimate scales of conduction of components in a gas-steam phase in deep conditions.

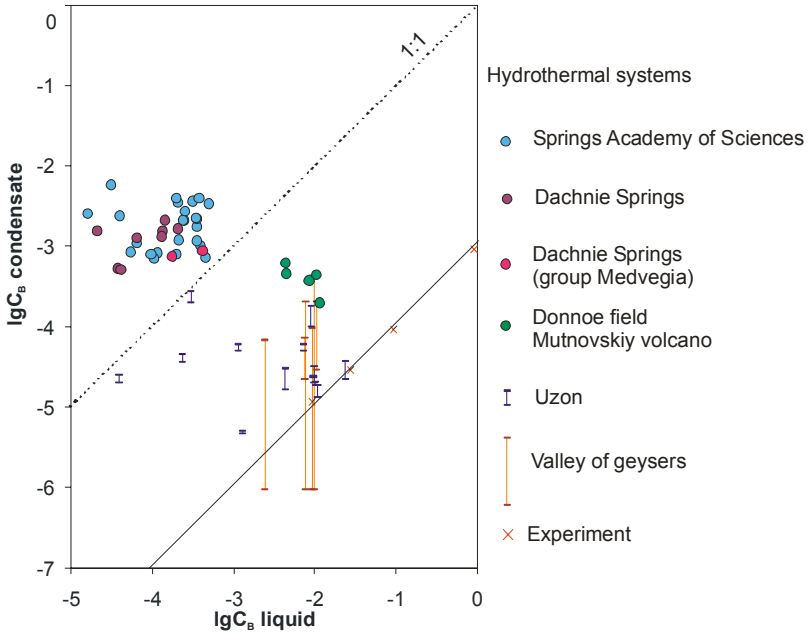

Fig.2.

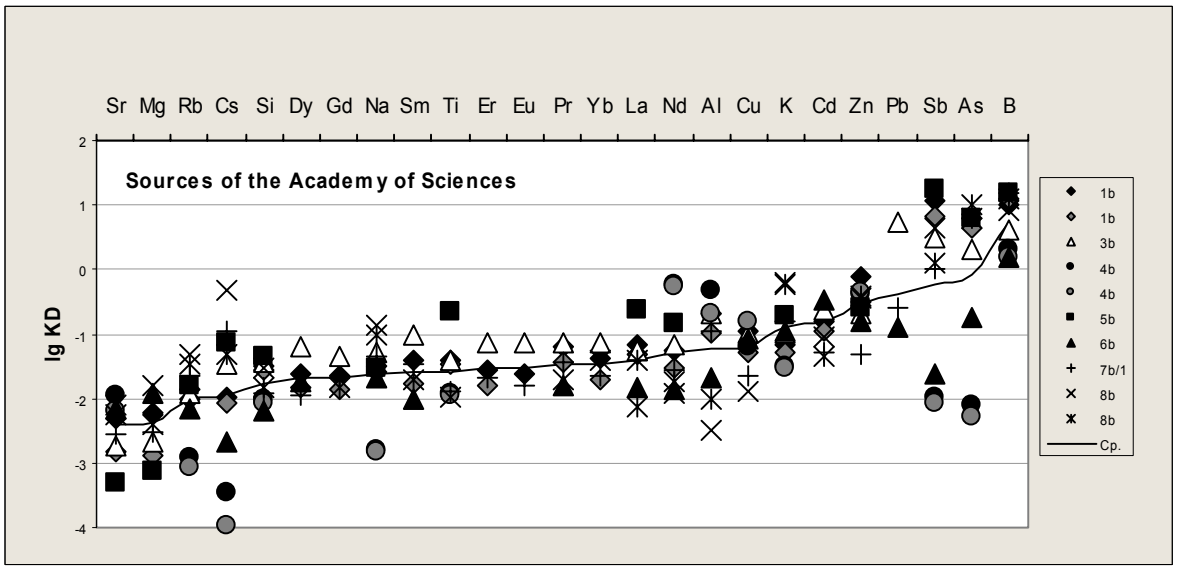

Fig.3. Seeming distribution numbers of elements for sources of the Academy of Sciences

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