

HYDROLYSABLE AMINO ACIDS IN NATURAL SALTS

Svetlana SHANINA

Institute of Geology of Komi Science Center of RAS, Pervomayskaya 54, 167982, Syktyvkar, Russia

This paper is devoted to investigation of amino acids composition in natural mineral salts from sedimentary rocks which accumulated in arid zones. Samples of halite and sylvite from several salt deposits distinguished by age, mineralogical composition and the stage of catagenesis were studied. As an example modern salt sedimentation salt of Lake Tekke (Cyprus) was analyzed. As ancient salt were investigated: Artemovsk deposit (primarily-sedimentation halite, Permian), Verkhnekamsk deposit (sylvite and halite, Permian), Petrikovsk deposit (recrystallization halite, Devonian), Kochmes deposit (secondary salt, Ordovician) and Seregovo salt dome (secondary salt, Proterozoic).

Analyses of amino acid enantiomers were made by the following technique. To extract amino acids samples were the subject of hot acid hydrolysis in 6M HCl. The solution obtained was out washed of organic compounds and etherified in N-PFP-amino acid isopropyl ethers. Analyses were carried out on gas chromatograph GC-17A with a flame-ionization detector.

It was established the large enantiomeric excess of L-form amino acid in all samples independently of their ages and mineralogical compositions. It confirms that fact, that amino acids in salt samples were evidently descended from a primary biogenic material.

The common contents of amino acids in salt samples are in dependence from contents in them of the insoluble remains. Upper bound (0.13–0.15 mg/g-rock) is typical for modern salt and potassium salt beds of Verkhnekamsk deposit which are characterized by the highest concentrations of insoluble remains. In other ancient salts concentrations of amino acids decrease in order and the lowest contents are characteristic for the cleanest salt samples. So concentration of amino acids in primarily-sedimentation halite of Artemovsk deposit is 0.037 mg/g-rock, but for spathic halite of underlying rock salt of Verkhnekamsk deposit – 0.014.

Moreover modern salt differs from ancient salt with individual amino acids distribution. So the highest contents of amino acids in samples of lake Tekke fall on aliphatic and acidic amino acids (up to 70 %), next amino acids in decreasing order are hydroxyl, aromatic, heterocyclic and sulphur. Among individual amino acids are prevail glycine, aspartic and glutamic acids, alanine, leucine and serine. In ancient salts the contents of acidic amino acids are often decreased while hydroxyl amino acids risen. The content of aromatic

amino acids is a little increased also. Among individual amino acids are prevail glycine, alanine and serine.

Amino acids distribution can change even within the bounds of one salt deposit, depending on a degree of transformation of organic matter in salt layers during post-sedimentation processes. Thus in spathic halite of Verkhnekamsk deposit with presence of liquid organic inclusions, content of heterocyclic amino acid (proline) is sharply rising. While in halite with presence of hard bitumen inclusions of Zechstein evaporites of Western Poland, which located over the oil and gas deposits, the contents of aromatic amino acid (tyrosine and phenylalanine) increase.

Our researchers have shown that the total concentration of amino acids is connected to the concentration of the insoluble remains of the salt rocks. Distribution of individual amino acids in many respects depends also on a degree of transformation of organic matter in salt rocks. Amino acids composition of ancient salts which accumulated in arid zones has the following features. In solar salt lake and closed seawater conditions dominate amino acids containing aliphatic, acidic and hydroxyl groups. Composition of amino acids changes with the increasing of organic matter maturity, at that concentration of acidic groups is reduced at increase of hydroxyl and aromatic differences.