

BIOLOGICAL PROPERTIES OF *ACIDITHIOBACILLUS FERROOXIDANS*

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The aim of this work was to study and analyze the main literature about the biological properties of acidophilic chemolithoautotrophic bacteria – the representatives of *Acidithiobacillus ferrooxidans* species.

Acidithiobacillus ferrooxidans normally inhabit areas with acidic pH (1,5 – 2,5). These bacteria are widely distributed in water, soil, ore deposits. *Acidithiobacillus ferrooxidans* is a typical microorganism of metal and sulfide substrates, and therefore it can be used as industrial microorganisms for bioleaching of metals. These bacteria are small rod-shaped gram-negative rods with one polar flagellum. Depending on growing conditions they can form pairs and chains.

The systematic position of the species has changed during the last several years. Formerly, these bacteria belonged to the genus *Thiobacillus*. Now basing on the results of 16 sRNA investigations, the bacteria were referred to a new genus *Acidithiobacillus* and recently new proteobacterial class *Acidithiobacillia*.

Acidithiobacillus ferrooxidans has one circular chromosome and has not plasmids. They are mesophilic because the optimum of temperature for their growth is $30,0 \pm 2,0^{\circ}\text{C}$. *Acidithiobacillus ferrooxidans* is an obligate aerobic microorganism.

They are the chemolithoautotrophic bacteria, which use the inorganic sulfur compounds or ferrous irons as a source of energy. But the last investigations have shown that this microorganism can use organic compounds too. Therefore these bacteria realize the mixotrophic type of nutrition. Usually this microorganism oxidize ferrous irons to ferric irons and different compounds of sulphide minerals (сульфидные минералы). However, the study of oxidation of sulfur compounds are complicated by their high reactivity, which under aerobic conditions results in spontaneous oxidation products.

As it was mentioned above, *Acidithiobacillus ferrooxidans* are used in the process of bioleaching of metals. For example bioleaching of pyrite can be divided into two steps. In the first stage oxidation occurs with microorganisms, adherent to the solid mineral surface, using the contact mechanism.

In the second stage the main factor is the dissolution of pyrite. It is an indirect mechanism using ferric irons, recovered by microorganisms in solution. Thus, the initial attachment of microorganisms to the surface sulfide plays an important role in achieving a high rate of dissolution of the mineral in the second stage.

Thus applying these microorganisms on coal processing facilities is very important for purification of rare and valuable metals from technogenic wastes.