Summary:

Throughout the world there are many places with a high concentration of arsenic in water. In the Czech Republic is such a place the gold-bearing area of Mokrsko, where arsenic in groundwater reaches the values, which are well above recommended limits for drinking water. Arsenic in the soil at Mokrsko is bound to secondary minerals with iron. Due to the work of microorganisms the weathering of these phases occurs, the reduction of Fe (III) and As (V) occurs, by which the toxic arsenic in its dissolved form gets into the groundwater.

Microbial dissolution of minerals containing arsenic is being researched by many teams of scientist. If the stability of Fe and As minerals during the microbial reduction is explained, it is possible to understand and perhaps effectively solve the problem of arsenic contamination in natural aquifers.

For the purpose of this research the microbial reduction rate of iron and arsenic synthetic mineral phases (arseniosiderite, goethite, scorodite and ferrihydrite) and natural pharmacosiderite has been determined and compared. The results of the dissolution kinetics were compared with the reductive dissolution of the natural sample from the Mokrsko area.

The samples were characterized by X-ray methods, SEM-WDX, SEM, BET; the content of iron and arsenic in the phases has been determined. With the help of batch incubation experiments with bacterial colonies from the Mokrsko area were the samples subjected to the reducing microbial dissolution.

From the minerals which have been used in the batch incubation experiments the ferrihydrite, which also has the largest surface area (276 $m^2 \cdot g^{-1}$), has been the most stable. It released arsenic at $1{,}09 \times 10^{-16}$ $mol \cdot m^{-2} \cdot s^{-1}$. The crystaline scorodite with its surface area of 16 $m^2 \cdot g^{-1}$ has dissolved the fastest at a rate of $31{,}36 \times 10^{-13}$ $mol(As) \cdot m^{-2} \cdot s^{-1}$.

The results show that the most important aspect regarding the release of arsenic from these minerals is probably the value of a specific reactive surface area, where the arsenic may be during the microbial dissolution resorbed. The release rate of arsenic from the sample from the Mokrsko area has been $11{,}92 \times 10^{-13}$ $mol \cdot m^{-2} \cdot s^{-1}$, and probably has been influenced by the presence of scorodite, arseniosiderite and pharmacosiderite, which are the phases with the highest rate of microbial dissolution.