

SEASONAL PECULIARITIES FORMATION OF SLOPE STRUCTURE OF SALT WASTE PILES

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At potassium mines of the Verkhnekamsky deposit (North Ural, Russia), waste of production is heaped on an earth surface as flat-topped salt waste piles. Matter going into waste piles is colourless or grey with a pink or yellowish shade natural grains and crystals of halite. Granulometric composition of salt waste is rather uniform and is determined by the technological parameters of cycles. High solubility of salt waste resulted in that the prevailing geomechanical process on the waste piles is dissolution.

There is a strong redistribution of substance. The initially homogeneous matter is divided, ready-soluble compounds are transported to deeper regions of waste piles and to their bounds, insoluble and fixed compounds are collected on the surface. The brines in waste piles go downwards, therefore on the surface mainly vertical structures of destruction are formed. The slopes of waste piles are covered with plenty of such structures, which we “name cavities of dissolution”. The depths of these cavities reach more than 18–20 m, diameter 1–1.2 m.

Seasonal climatic changes of the region cause that on the surface there is a non-uniform distribution of cavities. The active formation goes on only in the summer, when plenty of water falls as rain and air temperatures are positive. Dissolved halite partially crystallizes and cements the un-altered grains of halite. Thus a strong skeleton fixing the initially highly porous rock is quickly formed. The free infiltration of moisture through its pores and the development of cavities goes with high speed.

In the winter, when free moisture is absent and negative temperatures are prevailing, the halite grains are cemented by hydrohalite. If the temperature is higher +0.15 °C (and even at negative temperatures) hydrohalite is destroyed with the formation of microcrystalline halite. This matter partially fills pores, initial porosity of rocks is reduced, and before the start of the period of active geomechanical processes the rock has time to be condensed. The development of cavities on such sites is difficult, the formation of a cavernous-cellular structure does not occur or this process happens on a rather insignificant scale.

Thus, on slopes of salt waste piles areas with a various degree of development of cavities are formed. The intensity of dissolution and evacuation of salts for the bounds of waste piles is maximal on sites leached out in the summer.

Such phenomena are characteristic for other regions where KCl salts are mined.