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TRANSFORMATION OF ROCK FORMING MINERALS OF A SALT BED IN A TECHNOGENIC FIRE ZONE

ROCHEV, A. (Institute of Mineralogy UB RAS, Miass, Russia)

In January 1995 a technogenic earthquake took place in one of the mines of Verkhnekamsky deposit (North Ural). As a result of it a local fire rose in mine workings which proceeded for 5 days. The breaking of high-voltage cables ignited combustible gases and dispersed organic matter. Salt rocks were exposed to warming up to 900 °C in the fire center and to 170–200 °C in the distant parts. The "motley" sylvinites of a salt bed have been exposed to an ignition.

Rock forming minerals are halite and sylvite, both presented by large, up to 2–3 cm, grains; while gypsum, clay minerals from the illite-montmorillonite group and dolomite fill in the intergranular space or compose thin beds. As a result of heat affecting minerals of a bed have undergone structural and compositional changes.

In the zone of intensive warming-up sylvinite has gained more light tints with contrasty dark spots in places of accumulation of unsoluble minerals. Primary mineral composition and mineral relations were not transformed practically. Occasionally it is possible to find the traces of dissolution of salt minerals. In the unsoluble residuum of salts of this zone all of the above mentioned minerals are found.

The field of rocks transformed under the action of volatile combustible products formed at a distance of 30–50 m from the combustion zone. Water and pitch-like organic matter were formed as a result of burning of hydrogen, methane and other hydrocarbons. Water and pitch-like matter were carried out of the zone of high temperatures as gases condensed on decreasing of temperature. Water condensed on drift walls also solved sylvite. As a result of sylvite solution fields of high porosity were formed containing mainly transparent halite and rare relics of not completely dissolved white sylvite grains. Pitch-like matter settled in these pores and painted the rock black. In the unsoluble residuum except for organic matter rare rhombohedra of dolomite and intergrowths of needle-like crystals of gypsum were established.

Directly in a combustion zone temperature was risen up to 900 °C and above. Halite and sylvite have been fused, and the salt melt has flowed down a wall drift. Dark brown sinters with a thickness of 3–5 mm were formed. X-ray and optical immersion studies revealed that the unsoluble residuum of fused salts practically consists of small grains of microcline with small admixing dark brown concretions of ferric oxides. (The latter appear in an immersion liquid as dark red isotropic flakes with high refractive index.) The minerals of the unsoluble part, unrepresentative for the original salt rocks, were formed by the thermal transformation of clay minerals and ferric oxy-hydroxides. Original sulphates and carbonates were thermally decomposed.

This study revealed that the transformed salt rocks show a clear zonation of mineral composition relative to the center of burning and therefore were formed during a fire.