

The late miocene pelitic siltstone of the ishim formation (Southwestern Siberia): Mineralogical and geochemical characterization and prospects for further use

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Abstract

© 2018, Academy of Sciences of the Czech Republic,. All rights reserved. The Miocene Ishim Formation is characterized by a considerable distribution area within the southwestern Siberia. These deposits are highly dispersed and are composed mainly of angular quartz grains of aleuritic and pelitic fractions. The study of the Ishim Formation is of interest both for investigating the origin of the sediments, and for justifying these rocks as a new type of mineral raw material for the local construction materials industry. This paper presents the results of first complex studies of the Ishim Formation deposits from two outcrops Masali and Bigila. The studies included determination of the particle size distribution on the laser particle analyzer, semiquantitative determination of the mineral composition (X-ray diffraction analysis), as well as, determination of contents of sesquioxides (X-ray fluorescence analysis), rare and trace elements (Inductively Coupled Plasma Mass Spectrometry) and measurement of specific surface area. The most representative samples were chosen for petrographic studies. In certain extent these deposits are characterized by quite high degree of homogeneity of the mineral, chemical, and granulometric compositions. The main component is SiO₂ (about 70 %); other most important components are Al₂O₃ (about 14 %) and Fe₂O₃ (2-5 %). At the same time, deposits of the upper part of the Ishim Formation are depleted in CaO, MnO, MgO, TiO₂, and P₂O₅. This is probably due to the fact that the proportion of clayey minerals in the upper part of the formation is lower than that in the lower one. The contents of trace elements in the Ishim Formation are lower or close to their clarke values in the Earth's crust. This is with the exception of such elements as Eu, Tb, Cr, and Sb, which form a strong anomaly and, to a lesser extent, a number of other elements that is probably related to the tectonic setting during the period of sedimentation. The CIA values vary from 68-70 in the lower unit of the Ishim Formation at the transition to the sandy facies to 75-80 in the upper one, which indicates a moderate weathering of rocks. The results obtained testify to the fact that these deposits were formed under the conditions of degrading shallow water bodies. A distinct geomorphological confinement to boundaries of the Neogene river paleovalleys, continuity, high dispersion and, predominantly, quartz composition allow us to consider these deposits as a promising type of filler for construction materials industry.

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Keywords

Filler, Late miocene, Mineral addiction, Pelitic siltstone, Sedimentary rocks, Western Siberia

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