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X-ray microtomography and grain size analysis of bituminous sandstones from Ashalchinskoye oil field

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Abstract

X-ray microtomography on 4.6 mm long 4.7 mm diameter samples of bituminous sandstones from Ashalchinskoye oil field was performed with a spatial resolution of 5.8 μ m. The representative elementary volumes for grain size distribution were estimated along with porosity and permeability coefficients for digital cube geometry ranged between 0.3 and 3.5 mm (0.03-43 mm³). The representative elementary volume for grain size distribution was achieved at cube edge length of 2.3 mm (12.2 mm³). This value is almost 2 times higher than the estimation of representative elementary volume for absolute permeability tensor and almost 4 times higher than the estimation for porosity coefficient. It is shown that Kozeny's formula characterizing the dependence of the effective permeability coefficient on the grain diameter and the porosity gives lower values, compared with the permeability coefficients obtained by modeling flow processes on digital images.

Keywords

Grain size distribution, Image processing, Kozeny's formula, X-ray micro-CT