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Hydrate growth and electrical properties modeling based on digital rock techniques

Monday, 30 May 2022 09:40 (1h 10m)

During the exploration of natural gas hydrate reservoirs, the macro-scale spatial heterogeneity of hydrate sediments is caused by the formation of hydrates, which makes it difficult to predict the hydrate saturation accurately. In this study, random simulation methods are used to construct digital rocks under three types of hydrate growth habits (Grain-Coating, Pore-Filling, and Patchy), and the finite element method is carried out to simulate the resistivity of digital rocks. By extracting the pore size distribution parameters and fractal dimensions of digital cores under different hydrate saturations, the differences in the influence of the microstructure evolution of the three types of hydrate distribution on the electrical properties of the sediments are analyzed. The results show that with the increase of hydrate saturation, the change of microstructure caused by Grain-Coating type growth has the most significant effect on the electrical conduction process at the same hydrate saturation. The pore structure changes caused by Pore-Filling growth have the least influence on the electrical conduction process; the different pore size distribution of sediment under different hydrate morphologies explain the electrical differences of the three types of hydrate morphologies. Finally, the applicability of the empirical value is further verified by comparing the dissolved gas method hydrate synthesis experiment in the laboratory. Combined with the in-situ resistivity logging data, the difference between the empirical parameter values under the laboratory and actual reservoir conditions is analyzed.

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References

Time Block Preference

Time Block A (09:00-12:00 CET)

Participation

Online

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