Permeability Prediction Based on the Logging Data of Gas Hydrate Reservoir by Using Machine Learning Method

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Permeability, as one of the flow parameters, is of great importance for the study of oil, gas and hydrate reservoirs, and even the whole lithosphere. Traditional permeability prediction methods have high requirements on the type of logging data, and the empirical parameters are difficult to be adjusted according to the actual research situation, which include empirical equations and multivariable regression analysis. In this study, a total of 156 permeability measurements for Nankai Trough were obtained from the literature, and 101 of them were used in combination with logging data at the same depth as samples to train an artificial neural network, and the prediction accuracy of the obtained model was over 90%. Applying this model, we predicted the permeability values corresponding to the depth of all logging data points and substituted them into the hydrate generation prediction model used in the previous study. In our previous simulations, we used two representative permeability values to initially investigate the distribution of hydrate saturation under lithology control, and the permeability predicted by artificial neural network not only reflects the actual formation lithology variation more precisely, but also improves the accuracy of the simulation results after permeability improvement.

Keywords: Permeability, Gas Hydrate, Machine Learning