Prediction and Quantitative Characterization of Porosity for Shale Gas Reservoir

Zhuang Xu[1] and Wanzhong Shi[1]

[1]China University of Geosciences, Beijing, China

Abstract

Porosity of shale gas reservoir is a significant parameter used to evaluate the storage capacity of reservoir. This article is based on the research of the "three in one" of porosity of the shale gas reservoir, which included the geological parameters model of reservoir, the porosity of the rock physical, and the model of logging parameter. By taking into account of brittle minerals, organic matter, and clay minerals what contribute to total porosity, a methodology has been established in order to predict the porosity of shale gas reservoir both accurately and rapidly. Various resources have been used in the article, such as the test data, logging data and seismic data of Jiaoshiba area and Pengshui area. Correlation between parameters in the model of porosity and rock physical characterization of shale reservoir has been used to ensure the accuracy and feasibility of porosity prediction equation. Evidence is the fact that correlation between TOC content and log density curve is 84%. Therefore, TOC content can be predicted by using logging density curve. The correlation between silicon content and log density is 78%, showing that they are highly correlated. In addition, brittle minerals can be predicted by using the element log data. The content of clay mineral is highly correlated with the content of K, Th and U. The ratio among three elements and three - element equation can be used to not only predict types of clay minerals, but also predict its contents. According to the method, the calculated porosity is compared with measured porosity and log interpretation porosity. It is found that theoretical values coming from calculation model have good correlation with the experimental values in terms of both distribution pattern and numerical value of porosity. As a result, the model established below is both accurate and reliable.