1 Introduction

As new exploration domain for oil and gas, reservoirs with low porosity and low permeability have become a hotspot in recent years (Li Daopin, 1997). With the improvement of technology, low porosity and low permeability reservoirs are commonly found in most sedimentary basins, which makes this kind of reservoir more and more meaningful. The success of reservoir prediction depends mainly on finding reservoirs with sufficient porosity and permeability (Worden et al., 2000; Taylor et al., 2010). Reservoirs with low porosity and low permeability are characterized by diagenesis diversity, strong heterogeneity and complex fractures (Li Daopin, 1997; Yang Renchao, Fan Aiping, A. J. et al., 2014). Thus there is a great challenge to identify position of favorable reservoirs with low porosity and low permeability by traditional exploration means.

Sedimentary facies and diagenesis are the main factors controlling reservoirs pore evolution, and sedimentary facies controls porosity evolution at shallow burial depth while diagenesis affects pore evolution at deep burial depth (Meng Yuanlin, 2008; Zou Caineng et al., 2009). Diagenesis is a necessary process for the development and formation of all reservoirs, which ultimately determines the reservoir physical property. This is particularly true for reservoir with low porosity and low permeability (Wilson M.D., Stanton P.T., 1994; Li Z, Chen JS, Guan P., 2006; Zhang Shaonan, 2008).

Numerical simulation of diagenesis process is to select diagenetic parameters and simulate its temporal and spatial distribution, and then to evaluate favorable reservoir by simplified model according to actual needs (Zhang Jinliang, et al., 2013). Our research was to study reservoirs with low porosity and low permeability...
formation mechanism in burial process which is the basic principle of science. It can provide a good way for reservoir prediction in high diagenetic stage (Fig. 1).

2 Sedimentation and Diagenesis and Effects on Reservoirs

The porosity and permeability have close relation with the original composition and structure, which is controlled by sedimentary facies (Abdullah A. Z., Howard D. J., 2013; Jian Wang, Yingchang Cao, et al., 2017). It is found that sedimentation is a basic factor for generating low permeability reservoirs, and the strong compaction and cementation are the key factors for forming low porosity and low permeability reservoirs.

The effect of compaction, cementation and dissolution during diagenesis has been discussed by different scholars (Rashid D.D., 1985; Dacid B.B., 2001; Theodore T.M. 1996; Craig E.M., 1994).

3 Reservoir Prediction

At present, the numerical simulation methods fall into two major categories. The first category is based on physical or chemical model, which use single factor model to simulate the effect of diagenesis on pores while the other one only considers the comprehensive results of diagenesis on pores, but not caring about concrete diagenesis (Zhang Jinliang, et al., 2013; Jian Wang, Yingchang Cao, et al., 2017). In our study we firstly simulate the effect of different diagenesis on pores in burial history, and then a synthetic equation model was established, which can be used to compute the porosity of clastic reservoirs, particularly on reservoirs with low porosity and low permeability.

4 Conclusions

Based on burial process, a new reservoir diagenetic facies and porosity prediction method is presented. The method is primarily based on the identification of sedimentary facies, burial history, thermal history, pressure history, fluid history, diagenetic facies of individual well, which are derived from cores, well log data and seismic data.

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