Scholars Bulletin
(A Multidisciplinary Journal)
An Official Publication of "Scholars Middle East Publishers",
Dubai, United Arab Emirates
Website: http://scholarsbulletin.com/

ISSN 2412-9771 (Print)
ISSN 2412-897X (Online)

Correlation Analysis between Permeability and Pore Structure of Tight Reservoir

Li Shuming
College of earth science of Northeast Petroleum University, Daqing, Heilongjiang, China

***Corresponding Author:**
Li Shuming
Email: 593999296@qq.com

Abstract: Tight reservoir has become a hot spot of oil and gas exploration and development, meanwhile the study of pore structure is the core of the study of tight reservoir. Pore structure has a direct impact on the permeability of the reservoir. According to all kinds of pressure mercury parameters and permeability in correlation to determine pore throat size is the decisive factor of the reservoir permeability size, pore throat sorting and connectivity on the permeability of the influence is relatively weak.

Keywords: permeability, pore structure, tight reservoir, pore structure parameters.

INTRODUCTIN

Permeability is used to measure fluid through the interconnected pore degree of difficulty, such as clay, anhydrite, shale and some high cementation of sandstone, even if it is porous, oil, gas and water industry is hard to flow, the permeability is a measure of reservoir quality of the most important indicators for permeability studies in reservoir evaluation process is particularly important. The relationship between the different range of permeability and various types of mercury injection parameters and the correlation coefficient were analyzed to determine the relationship between the pore structure properties and tight reservoir permeability[1-2]. Pore structure including pore size, distribution, and interconnected relationship between characterization of pore structure parameter has a lot of, combined with the previous research on the pore structure of the nature of the research, this study, the parameters of which are: maximum pore radius (rd), flat are pore radius (rm), porosity distribution peak (rp); pore throat sorting coefficient (Sp), relative separation coefficient (DR), skewness (rm) (reaction sorting of pore throat); the maximum mercury saturation, the final residual mercury saturation, instrument is the biggest exit efficiency (reaction pore connectivity).

THE ANALYSIS OF THE ALL SAMPLES

First of all the conventional mercury injection samples (73 samples of 22 wells) pressure mercury parameters and permeability correlation were studied and then permeability larger than 0.1mD and permeability less than 0.1mD two intervals of different levels of penetration were studied. To get a more accurate and detailed conclusions[3].

According to the study of all conventional mercury injection samples using 22 wells 73 conventional mercury injection samples of conventional mercury injection parameters were studied and the correlation of permeability, the relationship between various types of mercury injection parameters and permeability, as shown in Figure 1, results show that parameters of maximum pore radius, radius, pore distribution peak value a characterization of the pore size and permeability were positively correlated, correlation, correlation coefficient R^2 was more than 0.6, reflecting the pore size of the reservoir permeability control effect is more significant, is the main control factors of reservoir permeability parameters; control effect of sorting coefficient, relative sorting coefficient, skewness and characterization of pore sorting the correlation between the parameters and permeability were significantly difference in the characterization of pore size, sorting coefficient, relative correlation coefficient of sorting, skewness and permeability decreased gradually, large differences reflect Pore sorting and storage of permeability relations more complex, but overall, effects of pore sorting on permeability to significantly weaker than the pore size, on reservoir permeability of control effect is poor; the final residual saturation, the maximum withdrawal efficiency, maximum mercury saturation to characterize pore communicating of the parameters and the correlation between permeability poor correlation coefficient R^2 is only about 0.2, is the worst of the pore structure of three parameter correlation, reflect pore connectivity of reservoir permeability has no control.

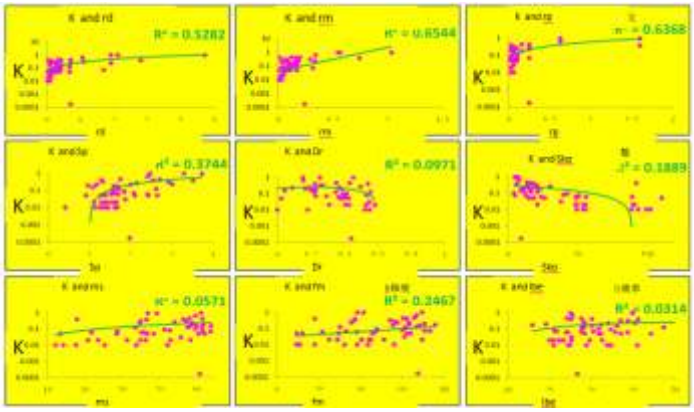

Fig. 1: Relationship between Permeability and mercury-injection parameters of all samples in Qijia area

STUDY ON THE PENETRATION RATE OF MORE THAN 0.1MD MERCURY SAMPLE

Study on permeability less than 0.1 mD mercury sample: the permeability of mercury more than 0.1 mD storage parameters of correlation with permeability using 39 conventional mercury injection samples, the preparation of a variety of mercury injection parameters and permeability diagram, as shown in Figure 9, results show that the maximum pore parameters the radius and the mean radius of pore distribution peak characterization of pore size and permeability were positively correlated, correlation, correlation coefficient R2 were about 0.8, reflecting the reservoir in the relatively high permeability, the pore size of the reservoir permeability control effect is more significant, is the main control factors of reservoir permeability; the parameters of pore sorting coefficient and permeability only have some correlation, the correlation coefficient was 0.4288, the characterization of pore connectivity parameters in the maximum efficiency is only the instrument exit and permeability The correlation, the correlation coefficient was 0.3898, the remaining parameters and permeability has almost no correlation. Therefore, in 0.1 the permeability of reservoir, the main control factors of pore size is the size of the permeability, and in such samples, the pore size control effect on permeability is stronger.

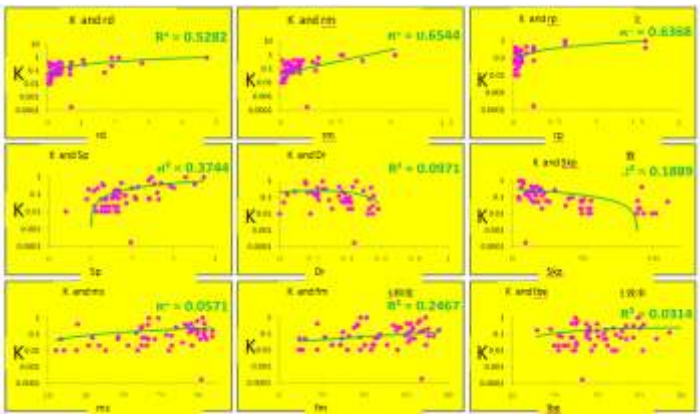

Fig. 2: Relationship between Permeability and mercury-injection parameters of the samples with less than 0.1 mD permeability in Qijia area

STUDY ON PERMEABILITY LESS THAN 0.1MD

Study on permeability is less than 0.1mD mercury sample: Mercury - reservoir parameters on the permeability less than 0.1mD of correlation with permeability using 34 conventional mercury injection samples, the preparation of a variety of mercury injection parameters and permeability diagram, as shown in Figure 10, results show that the maximum pore parameters the radius and the mean radius of pore distribution peak characterization of pore size were associated with positive correlation between permeability, moderate preference, correlation coefficient R2 at about 0.6, reflecting the pore size of the reservoir permeability control effect is relatively large; there is only the sorting coefficient and permeability correlation parameters of pore characterization, correlation coefficient 0.3744, reflect the pore permeability effect of moderate deviation of control reservoir; characterization of pore connectivity parameters only the final residual mercury saturation and permeability Certain correlation, the correlation coefficient is 0.2467 and other parameters and permeability basically does not have correlation and in permeability less than 0.1 of the tight reservoir, the pore size is still controlling permeability of main factors, single inferior to that of the conventional reservoir

control function is strong, pore sorting and connectivity of the control effect of reservoir permeability is very weak, and the rule is more complicated.

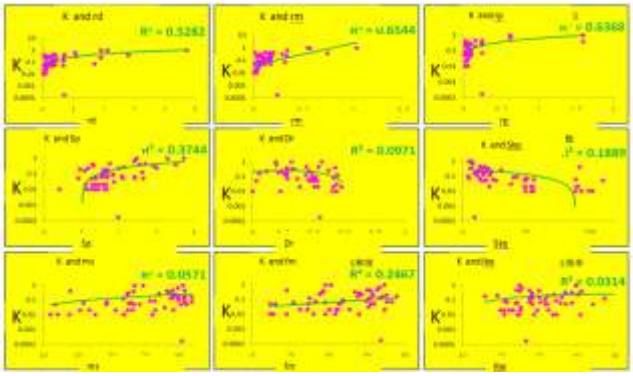

Fig. 3: Relationship between Permeability and mercury-injection parameters of the samples with more than 0.1 mD permeability in Qijia area

CONCLUSION

Through above three different levels of the permeability pressure mercury parameters and permeability correlation study, it found that pore throat size has good control effecton all levels of the permeability, but it has bigger influence on higher permeability, the influence of pore throat size decreasedwith the decreasing of permeability. The effect for sorting of pore throat and connectivity of reservoir permeability is relatively complex, as a whole less affected and sorting of pore throat effect greater than pore throat connectivity, reflecting the complexity of the low permeability reservoir permeability influence factor of diversity and rules.

REFERENCES

1. Dana, E., &Skoczylas, F. (1999). Gas relative permeability and pore structure of sandstones. *International Journal of Rock Mechanics and Mining Sciences*, *36*(5), 613-625.
2. Pittman, E. D. (1992). Relationship of porosity and permeability to various parameters derived from mercury injection-capillary pressure curves for sandstone (1). *AAPG bulletin*, *76*(2), 191-198.
3. Katz, A. J., & Thompson, A. H. (1986). Quantitative prediction of permeability in porous rock. *Physical review B*, *34*(11), 8179.