POROSITY DETERMINATION USING MODAL ANALYSIS ON THIN SECTIONS OF ROCK AND GORE MATERIAL AND SIMULATED WELL CUTTINGS

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With 2 figures and 5 tables

Zusammenfassung

Vergleiche von Gesteinsporositäten, die einerseits durch die Gasexpansionsmethode und andererseits durch das Punktzählerverfahren ermittelt wurden, zeigen, daß das Punktzählerverfahren dazu geeignet ist, Porositäten von Gesteinen, besonders von Spülproben, zu ermitteln.

Abstract

Porosities of rock samples obtained by modal analysis and by the gas expansion method are compared. Results indicate that modal analysis is a suitable method for determining porosities of rock samples, especially well cuttings.

Résumé

Deux méthodes pour obtenir la porosité des roches sont comparées. Les résultats indiquent que l'analyse intégratrice se compare bien à la méthode par expansion de gaz, spécialement si la méthode intégratrice est appliquée aux particules des formations détruites pendant les opérations de forage.

Краткое содержание

Сравниваются результаты определения пористости пород по методам газового расширения и подсчета точек. В результате последний способ признается пригодным для определения пористости пород.

Introduction

The porosity of rock samples is usually determined by the Boyle's Law method. To yield satisfactory results, the gas expansion method normally requires fairly large samples, such as plugs, which are usually cut from

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cores. Ditch samples, being small, require a more intricate procedure when analyzed for porosity by the Boyle's Law method which was investigated by M. RIECKMANN and T. BECKER (1962). In addition, the gas expansion method, by its nature, yields the effective porosity for gases, i. e., the pore space accessible to gases; but is less significant in determining the pore space accessible to liquids such as crude oils. In evaluating the storage capacity of a porous deposit, for example an oil reservoir, the effective porosity determined by the percentage of the pore volume occupied by liquid appears to be the more meaningful parameter.

In the course of our work with rock thin sections, we often have to impregnate friable specimens with clear epoxy resin. Dyed resin is frequently used for studies of pore sizes and pore geometry. Fluorol 7 GA, a fluorescent dye made by the General Dyestuff Company, is added to the resin. Pores filled with the fluorescent resin are easily visible in the thin section and can be readily distinguished from mineral grains. Because of this, an investigation was made of the feasibility of determining porosity of rocks by modal analysis of thin sections.

Modal analysis has become more popular among geologists in recent years, especially since F. CHAYES (1956) published his book, "Petrographic Modal Analysis". It was this author who formulated the basic area-volume concept and thereby established the validity of the method. He calls this relationship the Delesse relation and expresses it as follows: "The ratio of the area occupied by mineral A to the area occupied by all minerals is a consistent estimate of the volume percentage of mineral A in the rock." This principle applies to pores as well as to minerals.

The only reference pertaining to modal analysis as a means of determining rock porosities found in the literature was by N. M. STRAKHOV (1957). However, this author refers to conventional size thin sections cut from cores. Inasmuch as cores are not always available to the geologist, an attempt was made to determine rock porosities from the readily available well cuttings.

Several shortcomings have to be taken into account in using this approach. Well cuttings are never fully representative of a specific depth, e. g., a specific bed within the well. Being rather small, they do not lend themselves readily to modal analysis. A number of cuttings are, therefore, mounted into one thin section. Because of their size and shape, a regular modal analysis consisting of a given number of points, 1000 for instance, distributed along traverses of the same length and spaced evenly, cannot be made. On the contrary, the analysis has to be "tailored" to the irregular outlines of the components within the thin section. These shortcomings tend to introduce a bias and errors which will have a certain influence on the outcome of the analysis.

It stands to reason that nothing can be done about the nature of the well cuttings. They represent a mixture of components of the formation being drilled at a certain depth. The degree of contamination of the cuttings is virtually unknown. Very little is known about the influences on the rock texture by the breaking action of the drilling bit.