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Study on the parameter in Unconventional Energy Reservoir Based on CT Scanning

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Unconventional energy sources refer to forms of energy obtained through methods distinct from traditional approaches (Demirbas, 2016). These include not only renewable resources such as solar and wind energy but also less conventional sources like gas hydrate and tar sands. The significance of unconventional energy lies in its potential to diversify energy supplies and reduce dependence on conventional fossil fuels, marking a critical shift towards more sustainable energy practices.

The study of the micro-properties of unconventional energy reservoirs, as emphasized by Bera and Shah (2021), is essential for a comprehensive understanding of their intricate pore structures and the characteristics of fluid flow within these formations. This deep understanding is fundamental to refining extraction techniques, boosting energy recovery, and diminishing the environmental footprint of such activities. It underscores the importance of such studies in the realm of sustainable energy development.

In particular, the investigation of porosity in these reservoirs is of paramount importance. As Zou (2017) highlights, understanding the porosity is key to grasping the storage and permeability capacities of these reservoirs, which in turn has a direct and profound impact on the efficiency of resource extraction. High-precision porosity analysis is instrumental in evaluating the quality of these reservoirs and in formulating the most effective and sustainable extraction strategies.

The evolution of science and technology, particularly with the advent of electronic computing and the introduction of industrial CT (Computed Tomography) instruments, has offered robust technical support for the microscopic examination of various phenomena within the porous media of unconventional energy reservoirs. This technological progression has been pivotal in advancing our understanding and capabilities in this field.

Initially employed in the realm of medical diagnostics, where its revolutionary impact was first recognized by Seeram (2018) and Withers et al. (2021), CT scanning technology, specifically Medical CT (MCT), has since transcended its original application. At the close of the 20th century, the introduction of industrial CT instruments marked a new era in geological research. Pioneering studies by Roth et al. (1998) and Vogel and Roth (1999) employed specialized CT scanners to produce a series of detailed color images of soil bodies, representing a significant breakthrough in the field.

However, the early stages of CT application in geological research were not without limitations. The initial CT instruments suffered from low resolution when scanning samples, posing challenges for detailed quantitative analysis. This limitation underscored the need for continuous technological enhancements to improve the resolution and accuracy of CT imaging, thus enabling more precise and detailed investigations of porous media. The evolution of CT technology has since seen substantial improvements, leading to its current status as a powerful tool for micro-level analysis and characterization, particularly in the complex and varied contexts of unconventional energy reservoirs.

This paper aims to delve into the refined methodologies and applications of CT scanning in the microscopic characterization of the parameter within unconventional energy reservoirs, highlighting its pivotal role in enhancing our exploration of these critical energy sources.

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