



Editorial: Advances in Geology of Unconventional Hydrocarbon Resources

Dawei Lv^{1*}, Jon Jincal Zhang^{2*}, Dongdong Wang¹

¹College of Earth Science and Engineering, Shandong University of Science and Technology, Qingdao, China, ²Sinopec Tech Houston Center, Houston, TX, United States

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Editorial on the Research Topic

Advances in Geology of Unconventional Hydrocarbon Resources

For deepening our understanding on geological theory of unconventional oil and gas, we initiated this research topic and have gathered contributions from scientists working in diverse geoscience disciplines who have common interests in unconventional resources. In total, 16 papers have been included. The main topics include the following aspects: 1) shale gas in the Wufeng and Longmaxi formations, in the Marcellus formation, and shale gas exploration potential in southwestern Shandong Province of China; 2) shale oil in the Ordos Basin, in the Bohai Bay Basin, and in the Junggar Basin; 3) tight sandstone reservoirs and hydrocarbon reservoirs in volcanic rocks. These papers are briefly introduced in the following sections, and for more details readers can access each full paper from the links shown in this paper.

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Edited by:

David R. Lentz,
University of New Brunswick
Fredericton, Canada

Reviewed by:

Dave Keighley,
University of New Brunswick
Fredericton, Canada

*Correspondence:

Jon Jincal Zhang
zhangjon@gmail.com
Dawei Lv
lvdawei95@163.com

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SHALE GAS

The Fuling shale gas play was the first commercial, and remains the largest, shale gas field in China, producing more than $400 \times 10^8 \text{ m}^3$ of shale gas since its discovery in 2012. The major shale gas formations are the Wufeng and Longmaxi formations (Zheng et al., 2020); prolific because they are marine sediments with overpressures (Zhang, 2019). Herein are presented several papers. Wang et al. studied the accumulation mechanisms of normal-pressured fractured shale gas in the Wufeng–Longmaxi Formation in southeastern Chongqing. They found that the reason resulting in normal-pressure accumulation in this region was the intense tectonic activity. These tectonic movements could have potentially improved permeability of the shales. Wang et al. investigated shale gas exploration and development of the Longmaxi formation in the Sichuan Basin. They found that the diagenetic evolution is an important controlling factor on shale gas reservoirs. Sun et al. found that the shallow Longmaxi shale reservoir in Guizhou Province is dominated by adsorbed gas. The adsorbed gas occurs mostly in the organic matter nanopores.

Shale gas was also discovered in very old formations. Zhou et al. studied shale gas potential in the lower Cambrian Qiongzhusi shale formation in the Sichuan Basin. They concluded that the thick shale in the Deyang–Anyue rift would be the focus of shale gas exploration in the Qiongzhusi Formation.

Currently, although most shale gas plays are located in southern China, there is also shale gas exploration potential in northern China. For example, Li et al. discussed shale gas exploration in southwestern Shandong Province. Zhang et al. studied gas and oil potentials of the Lishui Sag in the

eastern China Sea Shelf Basin through modelling hydrocarbon generation of deeply buried type III kerogen.

To produce shale gas and other unconventional resources, hydraulic fracturing operations are needed, Ferguson et al. discussed effects of carbonate minerals on shale and hydraulic fracturing fluid reactions that can potentially impact porosity and microfracture integrity in the Marcellus formation in the United States.

SHALE OIL

Shale oil has been explored extensively in China. For example, Sinopec recently announced a discovery of shale oil with a predicted reserve of 458 million tonnes in the Jiyang Depression of the Bohai Bay Basin in November of 2021. The terrestrial sedimentation of the source rocks and tight shales affect shale oil abundance and its flowing ability. Zhang et al. studied sedimentary facies and evolution characteristics in the Nanpu area in the Bohai Bay Basin. Xu et al. presented a case study of the Shahejie Formation in the Dongying Sag of the Jiyang Depression in the Bohai Bay Basin to evaluate the movable shale oil resource. Furthermore, hydrocarbon reservoirs in volcanic rocks were discussed in the Laizhouwan Sag of the Bohai Bay Basin Xie et al.

Using experimental methods, Luo et al. evaluated the mobility of shale oil in the Junggar Basin. The Lucaogou Formation in the Jimsar Sag of the Junggar Basin is a typical lacustrine-deposited shale oil, and it was the first large-scale shale oil field in China. Zhao et al. discussed the total scanning fluorescence applications in shale oil in the same basin. Hou et al. presented a case study on the Chang 7 Member in the Ordos Basin for quantitative measurement of retained oil in organic-rich shale cores.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

TIGHT RESERVOIRS

In tight reservoirs, rock matrices have very low permeability; therefore, rock properties and natural fractures are key factors to control reservoir profitability. Wang et al. presented on the sedimentological influence on physical properties of a tight sandstone reservoir in the Cretaceous Nenjiang Formation in the southern Songliao Basin. A case study conducted by Zeng et al. in the Ordos Basin tight sandstone reservoir proves that wells drilled in the zone of faults have a higher oil production.

A tight sandstone reservoir in the Tarim Basin was discussed by Li et al. They conducted a quantitative evaluation of tight sandstone reservoir based on diagenetic facies in the Kepingtage Formation. This study identifies a favourable area for hydrocarbon exploration and development.

SUMMARY

In summary, the papers in this collection present an overview of research and case studies on unconventional hydrocarbon resources from a range of perspectives. We hope the articles in this research topic can provide insight and enhance our understanding in unconventional hydrocarbon resources, particularly unconventional oil and gas research and exploration in China.

AUTHOR CONTRIBUTIONS

All authors listed have contributed to the research topic and this editorial article substantially and intellectually. All agreed to the publication.

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