

PROCEEDINGS

## Water Occurrence and Its Influencing Factors in Tight Gas Reservoirs

Mianmo Meng<sup>1,\*</sup> and Wenming Ji<sup>2</sup>

<sup>1</sup> Hubei Key Laboratory of Marine Geological Resources, College of Marine Science and Technology, China University of Geosciences, No. 388 Lumo Road, Hongshan District, Wuhan, 430074, China

<sup>2</sup> Shandong Provincial Key Laboratory of Deep Oil and Gas, China University of Petroleum (East China), No. 66 West Changjiang Road, Huangdao District, Qingdao, 266580, China

\*Corresponding Author: Mianmo Meng. Email: mengmianmo@outlook.com

### ABSTRACT

Tight reservoirs hold a vast natural gas in Ordos Basin, and efficient development of these resources can offset the energy shortage. Due to the low-porosity and low-permeability, hydraulic fracturing becomes necessary to tap its resources. After fracturing, a large amount of fracturing fluid fills pore space near hydraulic fracture, which will influence the gas production. This study focused on the water occurrence of tight gas reservoirs and its influencing factors. Samples were selected from Upper Paleozoic Taiyuan and Shihezi Formations from Ordos Basin. The main experiments include porosity, permeability, mineral composition, nitrogen adsorption (NA), mercury intrusion porosimetry (MIP), nuclear magnetic resonance (NMR), high-speed centrifugation, and so on. The water occurrence was divided into movable water saturation ( $S_{mov}$ ) and irreducible water saturation ( $S_{irr}$ ). Further, the irreducible water saturation was divided into water saturation controlled by capillary force ( $S_{irrc}$ ) and water saturation in big pores controlled by small throat ( $S_{irri}$ ). In both Formations, the irreducible water saturation has a negative relationship with porosity, permeability, and average pore diameter, and a positive relationship with specific surface area. The  $S_{irri}$  has a positive relationship with the median pore-throat diameter in Taiyuan Formation, but the  $S_{irri}$  has a weak relationship with the median pore-throat diameter in Shihezi Formation. The  $S_{irrc}$  has a negative relationship with porosity, permeability, and average pore diameter, and a positive relationship with specific surface area in Taiyuan Formation, but the  $S_{irrc}$  has a weak relationship with these parameters in Shihezi Formation.

### KEYWORDS

Water occurrence; tight reservoir; NMR; movable water; irreducible water

**Funding Statement:** This work was supported by the National Natural Science Foundation of China (Grant No. 42102160) and the “CUG Scholar” Scientific Research Funds at China University of Geosciences (Wuhan) (Project No.2022077). The grantee of both is Mianmo Meng.

**Conflicts of Interest:** The authors declare that they have no conflicts of interest to report regarding the present study.



This work is licensed under a Creative Commons Attribution 4.0 International License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.