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# Conventional and unconventional petroleum "orderly accumulation": Concept and practical significance

Caineng ZOU ... Na WU

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### Abstract

Based on the latest global conventional-unconventional petroleum development situation and the conclusion of petroleum geology theory and technology innovation in recent 10 years, the connotation of conventional and unconventional petroleum "orderly accumulation" connotation is formulated. This concept indicates that, unconventional petroleum occurs in the hydrocarbon supply direction of conventional petroleum, and conventional petroleum may appear in the outer space of unconventional petroleum. Proper evaluation methods and engineering technology are important to push the conventional-unconventional petroleum co-development, and the petroleum

finding thought from outer-source into inner-source. Unconventional petroleum evaluation focuses on source rocks characteristics, lithology, physical property, brittleness, oil-gas possibility and stress anisotropy. Taking shale gas for examples, in China, these six properties are  $TOC > 2\%$ , laminated silicious calcareous shale or calcareous silicious shale, porosity 3%-8%, brittle minerals content 50%-80%, gas content 2.3-4.1 m<sup>3</sup>/t, pressure coefficient 1.0-2.3, natural fractures; in north America, these six properties are  $TOC > 4\%$ , silicious shale or calcareous shale or marl, porosity 4%-9%, brittle minerals content 40%-70%, gas content 2.8-9.9 m<sup>3</sup>/t, pressure coefficient 1.3-1.85, natural fractures. "Sweet spot area" assessment, "factory-like" operation pattern and other core evaluation methods and technologies are discussed. And 8 key elements of unconventional "sweet spot area" are proposed, 3 of them are  $TOC > 2\%$  (for shale oil  $S_1 > 2$  mg/g), higher porosity (for tight oil & gas  $> 10\%$ , shale oil & gas  $> 3\%$ ), and microfractures. Multiple wells "factory-like" operation pattern is elaborated, and its implementation needs 4 elements, i.e. batch well spacing, standard design, flow process, and reutilization. Through horizontal well volume fractures in directions, "man-made reservoirs" with large-scale fracture systems can be formed underground. For "shale oil revolution" in future, non-water "gas in critical state" and etc. fracturing fluid and matching technology should be stressed to be industrially tested and encouraged to be low cost developed.



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## Key words

unconventional petroleum; "orderly accumulation"; co-development; "sweet spot area" assessment; "factory-like" operation pattern; "man-made reservoir"; tight oil; shale oil; shale gas; tight gas; petroleum exploration into source rocks



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