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The influence of matrix lower limit on structure and flow characteristics in tight oil reservoir

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The formation space of tight oil reservoir is complex, which develops both matrix pores and micro-fractures, and the classification of matrix pore lower limit has an important influence on the structure and flow characteristics of tight oil reservoirs. In this paper, CT scanning method is used to acquire representative 3D grayscale images of matrix and micro-fracture samples in tight oil reservoir respectively, and the corresponding matrix pore and micro-fracture network models are extracted by the maximal ball method. Based on the matrix pore and micro-fracture network models with the same physical size, network superposition method is introduced to construct the tight oil reservoir network models by adding virtual connected throats, and the superimposed network could contain the structural characteristics of both matrix pores and microfractures. By setting different lower limits of matrix pore diameters, the matrix pore network with different lower limits are developed and the corresponding tight oil superimposed networks are constructed. It can be found that, as the lower limit of matrix pore diameter increases, the distribution curves of pore and throat diameter in matrix system keep shifting to the right, the average coordination number keeps decreasing, which shows poor connectivity. The contribution of matrix system to formation total porosity slightly decreases but does not change much, the contribution of matrix system to formation total permeability keeps decreasing; the imbibition relative permeability curve of oil phase keeps shifting to the right, and the imbibition relative permeability curve of water phase keeps shifting to the left, and the oil-water co-flow zone keeps decreasing.

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