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Flow Model and Flow Equation of Shale Gas Based on Micro Flow Mechanism

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Nano-Pore-throat are dominantly developed in shale, The flow of gas in the nano pore throat is different from that of the conventional pore throat. Shale flow has micro scale effects, and the flow is more complex, In order to establish the flow model and flow equation which can be used in the analysis of shale gas flow, In this paper, based on the single nanotube model , Combined with the Weiyuan Changning shale gas demonstration zone of the target layer of the longmaxi formation shale core high pressure mercury pore throat test results, calculated the contribution of seepage, diffusion, transition flow and free molecular flow to shale gas flow, and the contribution of seepage and diffusion are over 95 percent, seepage and diffusion are the main flow pattern. Then, established coupled flow model and the coupled flow equation of shale gas with seepage and diffusion, proposed calculation method of shale permeability and diffusion by Relationship between flow pressure and shale gas flow rate, finally, carried out and analyzed shale gas flow experiment, The results shows that The shale gas flow model and the flow equation established in this paper can describe shale gas flow well. Shale gas flow rate is composed of seepage flow rate and diffusion flow rate, seepage flow rate is proportional to the pseudo pressure difference, furthermore, is proportional to the pressure square difference in low pressure. Diffusion flow rate is proportional to the difference of shale gas density, furthermore, is proportional to the pressure difference in low pressure. With shale gas reservoirs'pressure drop, the proportion of the diffusion flow increases. The research results enrich the understanding of shale gas flow; it also has certain reference significance to the development of shale gas reservoirs.

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