Non-Darcy Flow in Tight Reservoirs

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The future of the energy sector in the coming years is expected to be significantly affected by unconventional gas resources. Most of the fundamental studies of flow in porous media are focused on the influence of the microscopic geometric structure on the macroscopic parameters. In order to address this question for flow through tight porous medium a series of single phase gas flow experiments were conducted. The considered porous medium sample was slot-pore type tight sand from the Travis Peak Formation with permeability in microdarcy range and porosity of 7%. Nitrogen and helium were the used gases. Single-phase experiments were conducted at different pressure drops and overburden pressures. They showed that the sample used is very sensitive to overburden pressure. Pore size distribution measurements, by mercury intrusion porosimetry and sorption isotherm, showed the existence of a wide range of pore size (from 0.4 to 400 nm) distribution. Moreover, the single phase gas flow through the sample particularly at low pressure is of Knudsen diffusion type. Thus, the gas molecules may slip at the wall of the capillary and the Klinkenberg formulation may be the approach to describe the deviation from Darcy's law.