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Storage and recovery of methane-ethane mixtures in single shale pores. HAIYI WU, RUI QIAO, Virginia Tech — Natural gas production from shale formations has received extensive attention recently. While great progress has been made in understanding the adsorption and transport of single-component gas inside shales' nanopores, the adsorption and transport of multicomponent shale gas under reservoir conditions (CH4 and C2H6 mixture) has only begun to be studied. In this work, we use molecular simulations to compute the storage of CH4 and C2H6 mixtures in single nanopores and their subsequent recovery. We show that surface adsorption contributes greatly to the storage of CH4 and C2H6 inside the pores and C2H6 is enriched over CH4. The enrichment of C2H6 is enhanced as the pore is narrowed, but is weakened as the pressure increases. We show that the recovery of gas mixtures from the nanopores approximately follows the diffusive scaling law. The ratio of the production rates of C2H6 and CH4 is close to their initial mole ratio inside the pore despite that the mobility of pure C2H6 is much smaller than that of pure CH4 inside the pores. By using scale analysis, we show that the strong coupling between the transport of CH4 and C2H6 is responsible for the effective recovery of C2H6 from the nanopores.

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