

Amgen Seminar Series in Chemical Engineering
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**Simulation of complex fluid processes in the subsurface:
Numerical models of underground CO₂ sequestration, heavy oil, oil shale, and oil sands.**

By

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Concern over global warming has made the sequestration of CO₂ national news. Subsurface storage of CO₂, often in depleted oil reservoirs, is being actively studied for this purpose. United States energy security policies have provided motivation for many energy companies to investigate strategies for in-situ extraction of liquid fuels from oil shale and oil sands. Simulation plays a critical role in evaluating the feasibility of both of these processes. While each of these applications has different goals, they are governed by similar physics and chemistry: multi-phase heat and mass transfer, a compositional formulation for the mixed hydrocarbon phase, and supercritical fluid behavior. For each of these problems, I will describe typical geologic settings, goals, and environmental concerns. Current state-of-the-art simulation techniques, including numerical formulation and nonlinear iteration techniques will be presented. Some example simulations will be shown that highlight current capability. Challenges to the accurate simulation of these large scale problems will be summarized and future directions presented.

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