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Numerical simulation of multicomponent multiphase reactive fluid flow in porous media

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Multicomponent multiphase reactive transport in porous media controls various phenomena in geological formations such as carbonization, fluid flow in a petroleum reservoir, mobility of radioactive waste in repositories, etc. Despite the obvious differences between these geological processes, they have much in common from a numerical simulation point of view.

We draw parallels between mathematical models of processes from two different areas of research. Firstly, we study the process of carbonization. Secondly, we consider the process of retrograde condensation, which is known to occur when natural gas flows in reservoir rock (during isothermal pressure reduction). Retrograde condensation is a property of multicomponent mixtures, such as natural gas.

Both systems considered exhibit complex behavior and phase transitions. But both systems can be described by the same generalized equations. We discuss the differences and similarities between these mathematical models.