Semi-continuous thermodynamics theory for a multiphase & multicomponent reservoir simulation framework

Fabio P. Santos [1]

[1] Department of Chemical Engineering, Federal University of Rio de Janeiro

Multiphase and multicomponent mixture flow are present in a several spectrum of applications, which goes from industrial process improvement to oil extraction. Modeling a multiphase and multicomponent flow usually involves volume-averaged procedure in N and M discrete phases and components, respectively. Unfortunately, in some applications, this modeling technique can be computational intractable, e.g., oil extraction, due to the large number of compounds needed to better represent the phenomenon of interest. In order to overcome this, most of multicomponent can be represented by a probability density function (PDF) and others some compounds can be still described by a discrete framework Jatoba2014153,Laurent2009449,Lage2007782. This approach, called semi-continuous thermodynamics (SCT) Cotterman1985, is often used to reduce the computacional cost of simulation with a large number of compounds. Likewise, this present work reformulates the conservation laws in porous media using SCT theory. The numerical validation is performed by comparing the classical discrete and the SCT approaches on 1D cases. Then, this methodology is extended to a simple 3D simulation case.

Keywords: *Compositional and reactive flows in porous media, semi-continuous thermodynamics (SCT), multiphase and multicomponent flow*

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1

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