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Four-phase equilibrium calculation algorithm for water/hydrocarbon mixtures

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Successful large-scale compositional reservoir simulation requires robust and efficient equilibrium calculations. In recent years a large number of papers have been published on the topic of three-phase vapor-liquid-aqueous (VLA) equilibria which frequently appear in hydrocarbon reservoirs. The presence of the aqueous phase increases the probability of equilibrium calculations to have issues. One may experience convergence problems or even not being able to distinguish a fourth phase altogether. This is generally due to the lack of good initial guesses, which is usually solved by proposing supplementary initial guesses which are designed to deal with a particular mixture. The commonly used approach is to perform a stability test, before the equilibrium calculation, which determines whether it is needed to add an additional phase. Another benefit of this approach is that the result from the stability testing provides a good initial guess for the phase equilibrium calculation. In this contribution we derive a robust algorithm which can deal with up to four phase equilibrium calculation. We demonstrate the algorithm and its robustness and efficiency in several examples from literature (mainly computing the phase envelopes of water/hydrocarbon mixtures).

Participation

In-Person

References

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Energy Transition Focused Abstracts

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