Contribution ID: **8** Type: **Oral Presentation**

Energy dissipation as heat in porous media flow

Thursday, 3 June 2021 11:00 (15 minutes)

The most common way to describe two-phase flow in porous media is to use the relative permeability equations for each phase. Also non-linear flux-force relations are now documented and in use. The energy dissipation can in both cases be well described by the entropy production in the system, or alternatively by the net entropy flow out of the system at steady state. Some of us have proposed to define the number of state variables in REV in a way that reduces the number of variables considerably [1]. The concept of local equilibrium in the REV has been explained and used to build an expression for the entropy production.
As the entropy production is invariant at any scale, we can use it to examine different sets of variables. A set of constitutive equations will follow, for which the Onsager relations should hold. First evidence in this direction has been found [2]. We explain how transport equations can be defined from on basis, in particular how the thermodynamic driving forces can be defined. We illustrate definitions by numerical and molecular simulations.

Time Block Preference

Time Block A (09:00-12:00 CET)

References

[1] Signe Kjelstrup, Dick Bedeaux, Alex Hansen, Bjørn Hafskjold, Olav Galteland, Non-isothermal transport of multi-phase fluids in porous media. The entropy production. Frontiers in Physics 6 (2018) 126 doi: 10.3389/fphy.2018.00126

[2] Mathias Winkler, Magnus Aa. Gjennestad, Dick Bedeaux, Signe Kjelstrup, Rafaela Cabriolu, Alex Hansen, Onsager-Symmetry Obeyed in Athermal Mesoscopic Systems: Two-Phase Flow in Porous Media, Frontiers in Physics 8 (2020) 60 doi: 10.3389/fphy.2020.00060

Acceptance of Terms and Conditions

Click here to agree

Newsletter

Primary authors: Prof. KJELSTRUP, Signe (Norwegian University of Science and Technology); BEDEAUX, Dick (PoreLab, NTNU, Norway); Mr GALTELAND, Olav (Norwegian University of Science and Technology); Mr RAUTER, MIchael (Norwegian University of Science and Technology); Prof. BERG, Carl Fredrik (Norwegian University of Science and Technology); Prof. HANSEN, Alex (Norwegian University of Science and Technology)

Presenter: Prof. KJELSTRUP, Signe (Norwegian University of Science and Technology)

Session Classification: MS6-A

Track Classification: (MS6-A) Physics of multi-phase flow in diverse porous media