Contribution ID: **434** Type: **Poster Presentation**

Semi-Analytical Model to Predict Dynamic Capillary Pressure - Water Saturation Relationships for Multiphase Flows in Porous-Media

Wednesday, 24 May 2023 16:10 (1h 30m)

The capillary pressure defines the difference in pressure between the non-wetting and wetting fluids. The capillary pressure is part of the flow governing equations and its definition can have a profound impact on the nature of fluids displacement in a multiphase flow environment. Conventionally, the capillary pressure - saturation relationships are determined under equilibrium conditions which signify that all the fluid-fluid interfaces that exist at the pore-scale maintain a static configuration at a certain instant in time. However, there exist experimental and numerical evidences that state that the dynamic nature of fluid flows indeed play a prominent role in defining the trends of the capillary pressure - saturation relationships. In this work we develop a first of a kind semianalytical model to predict the capillary pressure - water saturation curves during piston-like drainage displacement by integrating the dynamics of fluid flow based on fundamental laws of fluid mechanics.

The proposed semi-analytical model can potentially be incorporated into existing multiphase flow simulators to rapidly compute the capillary pressure at various saturations of the flow medium under dynamic flow conditions. The presented semi-analytical model has been validated against experimental and numerical data sets available in literature at various flow conditions and considering different sets of fluid properties. We noticed a satisfactory match of the results predicted by the proposed semi-analytical model against the literature data. After performing a holistic sensitivity analysis, we notice that the properties of the porous medium, fluids and the fluid-solid interactions play a significant role in defining the trends of the capillary pressure - saturation curves.

Participation

In-Person

References

MDPI Energies Student Poster Award

No, do not submit my presenation for the student posters award.

Country

Qatar

Acceptance of the Terms & Conditions

Click here to agree

Energy Transition Focused Abstracts

Primary authors: RABBANI, Harris (Texas A&M University at Qatar); PAVULURI, Saideep (Texas A&M University at Qatar)

Presenter: RABBANI, Harris (Texas A&M University at Qatar)

Session Classification: Poster

Track Classification: (MS09) Pore-scale modelling