Contribution ID: **329**

Type: **Oral Presentation**

A thermodynamically consistent and conservative diffuse-interface model for two-phase flows in complex geometries

Tuesday, 14 May 2024 14:15 (15 minutes)

In this work, a thermodynamically consistent and conservative diffuse-interface model for gas-liquid-solid multiphase flows is proposed. In this model, a novel free energy for the gas-liquid-solid multiphase flows is established according to a ternary phase-field model, and it not only contains the standard bulk and interface free energies for two-phase flows, but also includes some additional terms to reflect the penalty in the solid phase and the wettability on the solid surface. Furthermore, a smooth indicator function of the solid phase is also introduced in the consistent Navier-Stokes equations to achieve a high viscosity in the solid phase and preserve the velocity boundary conditions on the solid surface. Based on the proposed diffuse-interface model, the fluid interface dynamics, the fluid-structure interaction, and the wetting property of the solid surface can be described simply and efficiently. Additionally, the total energy is also proved to be dissipative for the two-phase flows in the stationary geometries. To test the present diffuse-interface model, we develop a consistent and conservative lattice Boltzmann method and conduct some simulations. The numerical results also confirm the energy dissipation and good capability of the proposed diffuse-interface model in the study of two-phase flows in complex geometries.

Acceptance of the Terms & Conditions

Click here to agree

Student Awards

Country

China

Porous Media & Biology Focused Abstracts

References

Conference Proceedings

I am not interested in having my paper published in the proceedings

Primary authors: ZHAN, Chengjie (Huazhong University of Science and Technology); Dr LIU, Xi (Huazhong University of Science and Technology); Prof. CHAI, Zhenhua (Huazhong University of Science and Technology)

Presenter: ZHAN, Chengjie (Huazhong University of Science and Technology)

Session Classification: MS09

Track Classification: (MS09) Pore-scale modelling